# PLANT BREEDING ABSTRACTS

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# PLANT BREEDING ABSTRACTS

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C. A. B.
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# Plant Breeding Abstracts*

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Vol. XXVIII, No. 1

## STATISTICS

1 IHM, P.
Varianzanalyse und Konfidenzbehauptungen. (**Analysis of variance and confidence statements**).
Züchter 1957 : **27** : 172–77.

A further mathematical study of the conditions under which the *t* test and related tests can be applied to varietal comparisons is given [cf. XXVI, 802]†.

2 WEBER, E.
Betrachtungen zur Diskriminanzanalyse. (**Considerations on discriminant analysis**).
Z. Pflanzenz. 1957 : **38** : 1–36.

An introduction to discriminant analysis is provided, with examples, special attention being paid to its applications in differentiating plant populations and in selection.

3 MÜLLER, K.-H.
Exakte Auswertungsverfahren des kontrollierten Anbauvergleiches. (**Exact procedures for evaluating the controlled cultivation comparison**).
Z. landw. Vers.- UntersuchWes. 1956 : **2** : 153–61.

The statistical adequacy of the method of controlled cultivation comparison devised by Engel is examined. The method is not regarded as fully satisfactory from the point of view of statistical analysis of the results.

4 BEHRENS, W. U.
Feldversuchsanordnungen mit verbessertem Ausgleich der Bodenunterschiede. (**Field-trial layouts which compensate better for soil differences**).
Z. landw. Vers.- UntersuchWes. 1956 : **2** : 176–93.

After discussing the comparative advantages and disadvantages of systematic *v.* randomized layouts, the author proposes a modification of such designs as the Latin square involving subdivision of the layout into as many blocks as there are treatments, each treatment occurring once only in each block, and keeping the number of diagonal contacts between identical treatments to a minimum. Such a modified design is said to be better than a simple randomized design in dealing with soil heterogeneity, especially with square plots. With elongate plots the advantages are less.

5 MÖBIUS, H.-J.
Bemerkungen zu einigen Fragen der Feldversuchsmethodik. (**Observations on some questions concerning field-trial technique**).
Z. landw. Vers.- UntersuchWes. 1956 : **2** : 282–94.

The rival statistical techniques for analysis of field-trial data based on (1) analysis of variance and (2) the method expounded in a series of papers by Atanasiu and referred to *passim* in *Plant Breeding Abstracts* are compared with the aid of a model experiment. The author finds analysis of variance more satisfactory for statistical purposes.

6 KALTOFEN, H.
Über Feldversuche einfachster Struktur. (**On field trials with the simplest structure**).
Z. Acker- u. PflBau. 1957 : **103** : 315–32.

The history of field trials in Germany is surveyed with special reference to the differences between German and Anglo-American methods. Special attention is paid to the possibilities of extracting useful information from field trials by non-statistical methods.

7 LANDI, R.
Prove spaziali e prove pluriannuali. (**Tests in space and tests over a number of years**).
Genet. agr. 1957 : **7** : 39–55.

Data on the yield of 12 wheat varieties tested in three different localities in 1954–55 are analysed. The variety Generoso was one of the best at all three places, and Fraschetta [Twig] one of the worst. The results from these tests are in general agreement with those in which some of the same varieties had been tested over a period of several years and it is suggested that time could be saved by setting up variety trials in a number of localities differing somewhat in climatic characteristics rather than waiting for the results of several years.

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* The method of transliteration of Russian and other languages written in Cyrillic script used henceforth in *Plant Breeding Abstracts* will be that recently recommended by the International Organization for Standardization. This differs in only minor points from that employed previously.

† References in square brackets are to volume and number of entry in *Plant Breeding Abstracts*.

# GENETICS

**Abstracts of papers read at the hundred and twenty-third meeting of the Genetical Society of Great Britain, held in the department of Genetics, The University, Sheffield, on the 2nd and 3rd April, 1957.**
Heredity 1957 : **11** : 284–88.

The following contributions are of principal interest to plant breeders and geneticists:—

8 *Ockey, C. H. Chromatid aberrations induced by substituted ethyleneimines.* (*p. 284*).

Ethyleneimines induced aberrations in cells at the early resting stage in *Vicia* root-tips. As the time interval between treatment and sampling increased, the ratio of chromatid exchanges between chromosomes to those within a chromosome became higher; the proportion of aberrations involving the long nucleolar chromosome also increased. In interpreting these results, use was made of Revell's hypothesis of chromatid exchange.

9 *Pateman, J. A. & Fincham, J. R. S. Enzyme production by mutant alleles at the* am *locus in* Neurospora crassa. (*p. 285*).

Several independently induced mutations are known to occur at locus *am*, each resulting in loss of ability to produce glutamic acid dehydrogenase. The investigations reported here deal with mutants $am^{29}$, $am^{32}$ and $am^{47}$. A few wild types have been obtained from $am^{29}$ x $am^{47}$ and $am^{32}$ x $am^{47}$ with a frequency of about 0·001–0·003%. These wild types breed true and possess enzyme activity comparable with that of the standard wild types.

From both $am^{29}$ x $am^{32}$ and $am^{32}$ x $am^{47}$ pseudowilds were recovered with frequencies of about 0·2 and 0·05% respectively. The pseudowilds do not carry a wild-type allele but apparently originate as disomics carrying two *am* alleles; subsequently they break down into heterocaryons. Pseudowilds and heterocaryons obtained by vegetative combination of strains $am^{32}$ and $am^{47}$ possess 15·50% of the usual enzyme activity of the wild type. Thus different *am* alleles are complementary in action with respect to production of glutamic acid dehydrogenase, when they are carried in separate nuclei in a heterocaryon. No pseudowilds have been secured from crosses between $am^{29}$ and $am^{32}$. It appears that *am* is a case of a complex locus closely concerned with the production of a specific enzyme.

10 *Fincham, J. R. S. & Pateman, J. A. A qualitative difference between alleles at the* am *locus in* Neurospora crassa. (*p. 285*).

Strains carrying a secondary mutation ($am^{l}$) induced by ultraviolet treatment of mutant $am^{47}$ produced a glutamic acid dehydrogenase which differed from the wild type of enzyme in that it had very little activity as extracted at 20° or lower temperatures but was capable of being reversibly activated by mild heat treatment and incubation with substrates [cf. XXVII, 3668]. The two types of enzyme did not interact in mixtures. Experiments in heterocaryons showed evidence of complementary interaction between $am^{l}$ and $am^{32}$ but none between $am^{l}$ and $am^{47}$.

11 *Demerec, M. Genetic studies with* Salmonella typhimurium. (*p.* 285).

A review of research on *S. typhimurium* at the Carnegie Institution, Cold Spring Harbour, New York, dealt with the mechanism of transduction, the genetically complex structure of gene loci, tests for allelism by means of abortive transduction, linkage relationships, the limitations of the transduction method for detecting linkage, the nonrandom distribution of genes on bacterial chromosomes and the action of suppressor mutations [cf. XXVI, pp. 594–96].

12 *Hartman, P. E. & Hartman, Z. Histidine-requiring mutants of* Salmonella typhimurium: *complete and abortive transduction.* (*p. 286*).

The sites of 44 histidineless mutations are localized within a small chromosome region. On the basis of the biochemical characterization of the mutant phenotypes, the region has now been divided into five functional units [cf. XXVII, p. 595], each unit being subdivisible by mutation and recombination. The order of the units on the linkage map corresponds precisely to the sequence of the biochemical steps involved, viz. formation of imidazoleglycerol phosphate ester (IGP), IGP dehydrase (locus *B*), imidazoleacetol phosphate ester transaminase (locus *C*), l-histidinol phosphate ester phosphatase (locus *G*) and l-histidinol dehydrogenase (locus *D*). Tests of over 400 different mutant combinations for functionally complementary reactions confirmed the above loci identifications. In addition, sites of mutation in the unit for IGP formation were grouped into three complementary classes corresponding to loci *E*, *F*, *A*. Each of the mutational sites studied was confined to a single locus and did not cause inactivation of adjacent loci.

The ratio of abortive to complete transductions (usually 10 : 1 with phage growth on wild-type cells in nutrient broth) may reach 250 : 1 in the case of complementary mutants. With additional recovery of the mutant donor type the ratio again becomes 10 : 1. Both as donor and recipient, *hi*-32, due to a mutation at one extremity of locus *B*, is exceptional in showing a complementary relationship with some other mutants also caused by changes within locus *B*. This behaviour may be due to the "unique 'leaky' nature of *hi*-32 and a gene-dosage effect, enhancing reactions on either side of the genetic block."

13 *Fyfe, J. L. Relational incompatibility in diploid and tetraploid lucerne.* (*p. 286*).

Attention is drawn to the inverse proportionality found between fertility and inbreeding in *Medicago sativa* and *M. coerulea* [cf. XXVII, 3103]. In both species, if fertility is expressed in terms of pod production per flower pollinated, each increase of 0·01 in the inbreeding coefficient of the progeny results in a reduction of just over 0·01 in the fertility of the mating. As this type of incompatibility depends on the relation between "uniting alleles", the term relational incompatibility is proposed for it. Such incompatibility has interesting implications with reference to the use of inbred lines of lucerne and to the evolution of self incompatibility.

14 *Haldane, J. B. S. The cost of evolution.* (*p. 286*).

Natural selection means that members of genotypes ill-adapted to the environment die prematurely or are partly sterile. The unit process of evolution is the replacement of one gene by another in a population. The total number of deaths involved in this process is independent of the intensity of selection when this is small. It depends on the rarity, before selection starts, of the gene selected, and on the degree of its dominance. A representative number of deaths is 30 times the number of individuals in a generation. Thus evolution at the rate of one gene substitution in 300 generations would lower the reproductive capacity of a species by about 10 per cent. This fact sets an upper limit to the rate of evolution.

15 *Harland, S. C. & King, E. Inheritance of mildew resistance in* Fragaria *with special reference to cytoplasmic effects.* (*p. 287*).

In investigations at the Department of Botany, Manchester University, England, incidence of mildew varied from light to very severe in a wide range of commercial varieties of *F. grandiflora*. Diploid *F. vesca* was in general less severely attacked, although cases of extreme susceptibility occurred. A haploid of *F. vesca* was completely immune whereas the corresponding diploid was lightly attacked. "In a cross of susceptible x relatively resistant, susceptibility appeared to depend on two major genes." Degree of susceptibility differed in reciprocal crosses; the cytoplasmic effects persisted in the $F_2$ and back crosses.

16 Dubinin, N. P.
**(The present state of the problem of heredity).**
Bjull. Mosk. Obšč. Ispyt. Prirod. (Bull. Moscow Soc. Nat.) 1957 : No. 2 : 5–15. [Russian].

This survey of genetics deals with such topics as physical and chemical properties of the chromosome and its constituent parts, relations between chromosomes and heredity, induced mutations, and the uses and dangers of radiation genetics. The value of new principles and methods in experimental genetics is demonstrated by general references to results obtained from crossing inbred lines of maize, experimental polyploidy, especially with sugar beet of which some valuable triploids are said to have been obtained, and the use of radiation methods in breeding higher plants and microorganisms.

17 Matzinger, D. F.
**Components of variance of diallel crosses of maize in experiments repeated over locations and years.**
Iowa St. Coll. J. Sci. 1957 : **31** : p. 469. (Abst.).

Theoretical covariances between relatives were obtained for a diallel cross between $S_1$ lines. Estimations of general and specific combining ability were obtained in terms of additive, dominance and epistatic variances. In the analysis over locations and years, the interaction component $\sigma^2_{Ay}$ was very large relative to the other interactions. A method of estimating epistasis is mentioned.

18 Baylor, M. B., Hurst, D. D., Allen, S. L. & Bertani, E. T.
**The frequency and distribution of loci affecting host range in the coliphage T2H.**
Genetics 1957 : **42** : 104–20.

Thirteen loci ($ht_1$–$ht_{13}$) were identified in phage T2 and marked in relation to one another and to previously known markers. The loci were scattered throughout the genome, mutation at one of them producing the same phenotype as mutation at any other. When mutations were accumulated by recombination, their effects were additive. The *ht* mutations extend the basic host range determined by alleles at locus *h*. It is suggested that the *ht* loci are analogous with the polygenes of higher organisms.

19 Kappert, H.
Die Bestimmung der notwendigen Populationsgrössen bei genetischen und züchterischen Arbeiten. **(The determination of the necessary size of population in genetical and breeding work).**
Z. Pflanzenz. 1957 : **37** : 329–34.

Tables are given showing the numbers of individuals required in order that a genotypic combination should occur at least once with probabilities of 99% and 95% respectively, for assumed frequencies of the genotype concerned varying from 0·05 to 90·0%. A further table gives the numbers required to assure the occurrence of an individual yielding respectively 10, 20 and 30% above the mean, in populations in which the variance is 0·1, 0·2, 0·3, 0·4, 0·5 and 0·6.

20 Paul, G. I.
**A method of estimating epistatic variance in random mating populations.**
Diss. Abstr. 1956 : **16** : Publ. No. 18,002 : p. 2287.

Four models involving symmetrical gene interaction (duplicate gene, complementary gene, multiplicative and optimum) and three involving asymmetrical interaction (recessive epistatic, dominant epistatic and suppressor gene) were analysed. In each model, there is a gene frequency at which additive genetic variance is at a peak; this occurs at intermediate gene frequencies for the complementary model and at low frequencies for the duplicate model.
Methods for estimating epistatic variance from the distribution of genetic variances in the covariance between relatives, determined from diallel cross data, are described.

21 Whitehouse, H. L. K.
**Mapping chromosome centromeres from tetratype frequencies.**
J. Genet. 1957 : **55** : 348–60.

Formulae are given for mapping chromosome centromeres from tetratype frequencies. Second-division segregation frequencies can be calculated when tetratype frequencies are available for an odd-numbered closed set of unlinked loci, e.g. *ab*, *bc*, *ca*. This cannot be done when the set is even-numbered. If any of the loci are linked, it may be possible to map the centromeres provided that the tetratype frequencies form a closed set of at least 3 values and that at least one of the linked genes is near the centromere.

22 Kopetz, L. M.
Zur Berechnung von Spaltungsreihen und deren Zusammensetzung in höheren F-Generationen von Selbstbestäubern. **(The calculation of segregation series and their composition in higher F generations of self-pollinating plants).**
Z. Pflanzenz. 1957 : **37** : 335–44.

Simplified formulae are presented for calculating the numbers in the different phenotypic classes in the $F_2$, $F_3$ . . . $F_\infty$ when different numbers of genes are operative, for cases where segregaton ratios of 3 : 1, 1 : 2 : 1 and combinations of them occur. In addition to the reduction in frequency of heterozygotes in the later generations there is also a reduction of the frequency of dominants and an increase in recessives; the intermediate groups suffer least change.

23 Fadeeva, T. S.
**(Some questions of the theory of dominance).**
Vestn. Leningr. Univ. (News Lening. Univ.) 1956 : No. 9 : 3–10 [from Ref. Ž. 1957 : No. 3 : p. 26]. [Russian].

Research relating to problems of dominance of characters by Darwin, Mičurin, Timirjazev and more recent Soviet writers is surveyed.

24 Parsons, P. A.
**Partial manifestation of a gene in complete three and higher point backcross data.**
Heredity 1957 : **11** : 217–22.

Fisher's method of estimating misclassification of an allele due to imperfect penetrance in 2-point linkage data is extended to deal with 3-point and higher-point data.

25 Calef, E.
**Effect on linkage maps of selection of cross-overs between closely linked markers.**
Heredity 1957 : **11** : 265–79.

"1. The formation of rare prototrophs among ascospores from crosses between two adenineless mutants (*ad*15 and *ad*17) of *Aspergillus nidulans* is most probably due to the occurrence of crossing over between them. Reciprocal crosses yield strictly complementary segregation patterns.

"2. Selection for crossovers between very closely linked markers lengthens the linkage maps, as compared with the maps based on non-selective analysis.

"3. The increase in recombination frequencies has its maximum near the point of selection. It spreads over segments of chromosome beyond those adjacent to the point of selection. And it is the greater the closer the linkage between the markers used for selection.

"4. Parallel to the increase of recombination frequencies in selective analysis, coincidence values higher than 1 are found in non-selective analysis between pairs of segments within an overall length of about 10 units.

"5. These increases can be accounted for by assuming that pairing is not complete along the whole length of every bivalent in every cell in meiosis, but partial and variable in length and position. Selection for crossovers at one point would also select the products of those cells in meiosis in which the probability of pairing around the selected point is greater than average." [Author's summary]

26 KHALIL, A. R.
**Joint interpretation of heterosis and genetic variances in two corn varieties and their crosses.**
Diss. Abstr. 1956 : **16** : Publ. No. 17,988 : 2286–87.

Genetic variances for ♂ parents and their crosses, ♀ parents and their crosses, and the observed degree of heterosis were analysed. The data were, on the whole, in accord with a genetic model involving no epistasis, no multiple alleles and no maternal effects. If this model were valid, most of the loci concerned would be partially dominant and the number of loci would be large though not extremely large.
It also appears that another model, this time involving multiple alleles, might also be consistent with the data.

27 LIMA-DE-FARIA, A.
**Goldschmidt's interpretation of the gene concept and the problem of chromosome organization.**
Hereditas, Lund 1957 : **43** : 462–65.

The writer argues that Goldschmidt's point of view contains a fundamental contradiction in that it equates the concept of the chromosome as a functional unit with that of a genetic unit.

28 ROSENBAUM, M.
**The role of protein synthesis in the early stages of bacterial virus infection.**
Diss. Abstr. 1956 : **16** : Publ. No. 18,644 : 2281–82.

The role of protein synthesis in infection with T2 phage was investigaged by treating cells of *Escherichia coli* with chloramphenicol, which inhibits synthesis of proteins but not of RNA and DNA. T–2 cells were also exposed to $C^{14}$-labelled glycine during the first 8 min. of infection, disrupted by sonic oscillation and fractionated by zone electrophoresis. Synthesis of phage DNA required prior synthesis of protein. Some of this protein may consist of an enzyme necessary for the synthesis of 5-hydroxymethyl cytosine which is found in the DNA of T2 but not in the DNA of *E. coli*. Production of phage DNA also requires at least one other protein, since the genetic behaviour of this DNA, in the absence of concurrent protein formation, differed from that of phage DNA in cells not treated with chloramphenicol. The latter conclusion was supported by the finding that DNA synthesis in T–5 infected cells was blocked by chloramphenicol, although T5 DNA, unlike T2 DNA, is chemically identical with the host DNA.

29 SCHAEFFER, P.
Existence d'une compétition entre molécules d'acides désoxyribonucléiques pour la pénétration dans les bactéries transformables. (**Occurrence of competition between molecules of deoxyribonucleic acids for penetration into transformable bacteria**).
CR Acad. Sci., Paris 1957 : **245** : 230–31.

Experiments using a transforming DNA labelled with radio-phosphorus and conferring resistance to streptomycin, an unlabelled inhibiting DNA and the culture Rd of *Haemophilus influenzae* indicate that the inhibiting DNA acts by preventing the penetration of transforming DNA into the bacteria. It is suggested that the two types of DNA compete for a receptor site or sites situated on the surface of the bacterial cell.

30 SCHAEFFER, P.
La pénétration de l'acide nucléique dans les bactéries réceptrices au cours des transformations interspécifiques. (**The penetration of nucleic acid into receptor bacteria during interspecific transformations**).
CR Acad. Sci., Paris 1957 : **245** : 375–77.

It is shown that differences in transforming activity of DNA from different species of *Haemophilus* cannot be attributed to differences in penetration, since the same quantity of DNA, irrespective of its origin, is always fixed by the receptor culture. Defective synapsis between DNA of donor and receptor bacteria of different species is postulated.

31 SCHAEFFER, P.
L'inhibition de la transformation comme moyen de mesure de la "compétence" bactérienne. (**The inhibition of transformation as a means of measuring bacterial "competence"**).
CR Acad. Sci., Paris 1957 : **245** : 451–53.

By means of a quantitative study of the inhibition of transformation by nontransforming DNA in a *Haemophilus influenzae* culture, it is shown that when the capacity of the culture for transformation is at its peak, almost all the cells are capable of reacting with DNA, although the frequency of transformation observed may not exceed about 5%.

32 FOX, M. S. & HOTCHKISS, R. D.
**Initiation of bacterial transformation.**
Nature, Lond. 1957 : **179** : 1322–25.

At the Rockefeller Institute for Medical Research, New York, a method of preserving pneumococci in the receptive condition for long periods by storage at −20° C. has been developed. The technique has made possible the kinetic analysis of the interaction between the bacteria and transforming DNA. Evidence has been obtained suggesting that (1) a reversible binding of DNA to the cells is followed by a slow irreversible step resulting in incorporation of the nucleic acid and transformation, and (2) the process of protein synthesis upon which the formation or repair of absorption sites apparently depends may be carried out even when the bacteria are in the resting stage.

33 FREDERICQ, P.
Colizine und Bakteriophagen. (**Colicins and bacteriophages**).
Protoplasma 1957 : **48** : 583–98.

A review of the subject is presented for the benefit of German readers.

34 MICHAELIS, P. & BARTELS, F.
**Segregation of plasmagenes and the determination problem.**
Science 1957 : **126** : 261–63.

Disturbances in the development of cell layers, characteristic of *rhytidiophyllum* types of leaf pattern in *Epilobium hirsutum*, are interpreted on the basis of the unequal distribution of plasmagenes during somatic cell division. It is suggested that differentiation of normal tissues may depend upon plasmagene segregation.

35 JINKS, J. L.
**Selection for cytoplasmic differences.**
Proc. roy. Soc. : Ser. B : 1957 : **146** : 527–40.

"Colonies arising from single asexual spores of the fungus *Aspergillus glaucus* show differences among themselves in germination, growth rate, pigmentation and sexuality. These differences are transmissible, at least in part, to daughter colonies produced by asexual reproduction. They are independent of the nucleus and must be referred to persistent differences in the cytoplasm, arising presumably by unequal distribution of cytoplasmic elements during spore formation.

"Selection for these cytoplasmic differences can produce marked changes in phenotype comparable with those which arise during the normal processes of differentiation, cell delimitation, ageing and senescence, and may ultimately lead to biologically important differences, e.g. the complete elimination of pigmentation and sexual reproduction. Nevertheless, there are limits, albeit wide ones, to the changes realizable by selection of the cytoplasm, probably imposed by the inviability of the more extreme phenotypes. Within these limits variation is continuous. The various characters are highly but not completely, correlated in their response to selection.

"All the changes were reversible by back selection and could be wiped out by mixture of the selected cytoplasms with that of an unselected line. The invariable success of back selection shows that total loss of self-reproducing elements, or total loss of their functions, is not involved in any of the changes which must therefore be referred to change in the balance of cytoplasmic elements, in constrast to the *petite* variants in yeasts.

"The direct action of natural selection on the cytoplasm must play its part in the adjustment of the phenotypes in a fungus like *A. glaucus*, and would provide an element of flexibility, prospectively of great importance in adaptation of a saprophytic fungus to its ever-changing environment." [Author's summary]

36 STUBBE, W.
Dreifarbenpanaschierung bei *Oenothera* I. Entmischung von drei in der Zygote vereinigten Plastidomen. (**Three-colour variegation in *Oenothera* I. Separation of three plastidomes combined in the zygote**).
Ber. dtsch. bot. Ges. 1957 : **70** : 221–26.

Variegated plants from a cross between the hybrid *albicans* x *gaudens* with green *lamarckiana* plastids and the hybrid *albicans* x *hookeri* with white *suaveolens* plastids were pollinated by a hybrid with yellow-green *suaveolens* plastids. Among the progeny were a few plants with triple variegation, indicating that the mother plant contained mixed egg cells. Microscopic study of the three-colour plants showed that in some cells, notably in the cotyledons, all three plastid types were present together, without any intermediate forms, suggesting that plastid type is not appreciably influenced by cell environment.

37 Kimura, M.
**Stochastic processes in population genetics.**
Diss. Abstr. 1956 : **16** : Publ. No. 18,413 : p. 1779.

[Cf. XXVII, 1061].

38 Renier, A.
Applications du calcul matriciel à la génétique des populations. (**Applications of matrix calculus to population genetics**).
Ann. Inst. exp. Tab. Bergerac 1956 : **11** : 165–231.

The principles of matrix algebra are explained and its usefulness in analysing such mating systems as panmixis, selfing, sib mating, parent-offspring mating and double first-cousin mating is illustrated. A final section deals with tetrasomic inheritance.

39 Roper, J. A. & Käfer, E.
**Acriflavine-resistant mutants of *Aspergillus nidulans*.**
J. gen. Microbiol. 1957 : **16** : 660–67.

An abstract of this article has already been summarized in XXVII, 1092.

40 Wettstein, D. von
**Genetics and the submicroscopic cytology of plastids.**
Hereditas, Lund 1957 : **43** : 303–17.

Mainly with reference to papers already published, the author surveys information on chloroplast anatomy and on the development and continuity of chloroplast structures in thallophytes and higher plants, as revealed by the electron microscope. He then discusses the effects of gene mutations in barley [cf. XXVII, 4031] and of plastidome mutants in *Oenothera* upon the structural differentiation of plastids and upon chlorophyll synthesis. The paper concludes with a short review of investigations on the non-Mendelian inheritance of plastid characters.

41 Dean, A. C. R. & Hinshelwood, C.
**The formation of papillae on bacterial colonies. I and II.**
Proc. roy. Soc. : Ser. B : 1957 : **147** : No. 926 : 1–20.

From experiments on *Bacterium lactis* var. *aerogenes* and *B. coli* var. *mutabile* on agar plates containing drugs or various sugars, it is concluded that the formation of papillae or secondary colonies may be interpreted in terms of colloidal chemistry rather than as a simple expression of random mutation for drug resistance or adaptation.

42 Novick, A. & Weiner, M.
**Enzyme induction as an all-or-none phenomenon.**
Proc. Nat. Acad. Sci. USA 1957 : **43** : 553–66.

The authors conclude that the induced synthesis of β-galactosidase is *Escherichia coli* at low concentrations of the inducer (thiomethyl-β-d-galactoside) bears a close resemblance to the phenomenon of mutation in that (1) each of these processes is an all-or-none change when a single bacterium is considered, (2) all the offspring of a mutant bacterium are mutants and all the progeny of a bacterium in which adaptation has been induced are adapted so long as a low concentration of the inducer is present, and (3) both processes involve a random single event. The genetic-like behaviour of enzymatic adaptation may be explained on the basis of the "concentration within the bacteria of inducer by a mechanism whose formation is also induced by the presence of the inducer. Inducible transport mechanisms of this kind may exist for a variety of substances which enter the cell, and as a result, careful distinction must be made between mutation and induced changes."

43 Barksdale, W. L., Li, K., Cummins, C. S. & Harris, H.
**The mutation of *Corynebacterium pyogenes* to *Corynebacterium haemolyticum*.**
J. gen. Microbiol. 1957 : **16** : 749–58.

*C. pyogenes* has been observed to give rise spontaneously to mutants indistinguishable from *C. haemolyticum*. On the basis of their cultural characteristics it is suggested that both organisms belong to the genus *Streptococcus*.

44 Ho Sik Kim, Geddes, W. F. & DeVay, J. E.
**Studies on the synthesis of alpha-amylase and free amino acids by mutants of *Aspergillus oryzae.***
Mycologia 1957 : **49** : 453–62.

Ultraviolet rays and α radiation from $Po^{210}$ were used to produce mutations in race 6A of *A. oryzae.* Mutations which affected α amylase synthesis also influenced aminoacid metabolism. The mutant 6A20M8 produced more than twice as much α amylase as 6A.

45 Kihlberg, G. & Fries, N.
**Some experiments with induced mutations in *Trichophyton mentagrophytes.***
Svensk bot. Tidskr. 1957 : **51** : 36–42.

Biochemical and morphological mutants were obtained by ultraviolet irradiation of conidia of *T. mentagrophytes*, some of the former being identical with previously described species. All combinations of the biochemical mutants were able to grow on minimal media, apparently by means of syntrophism since heterocaryotic mycelia were not obtained.

46 Zimmer, K. G.
**A physicist's comments on some recent papers on radiation-genetics.**
Hereditas, Lund 1957 : **43** : 201–10.

The author's comments deal mainly with the possible causes of the different results obtained from early and more recent work on the relative mutagenic efficiency of X rays and fast neutrons in *Drosophila.* He concludes that faulty techniques and inadequate methods of dosimetry are not responsible for the divergence, the real source of which is not yet known.

**Symposium on the effects of ionizing radiation on plants.**
Quart. Rev. Biol. 1957 : **32** : 1–56.

A symposium on the above topic was held at the 1956 meeting of the American Institute of Biological Sciences. It was arranged chiefly for biologists without specialist knowledge of radiobiology or genetics. Introductory remarks to the meeting were contributed by A. H. Sparrow, who outlined the development of radiobotany which began with investigations on the injurious effects of X rays at the end of the last century.

47 *Gordon, S. A. The effects of ionizing radiation on plants: biochemical and physiological aspects. (pp. 3–14).*

The author postulates that primary damage due to ionizing radiation has its site in the cytoplasm and causes impairment of auxin synthesis. "If we consider the cytoplasm *in situ* not as discrete autonomous molecular units but rather as a bonded, continuous micellar net, we have our enormous radiation target. It is a target that permits not only intramolecular but also intermolecular electron transfer. Hence it is synonomous with a volume wherein energy flow may occur irrespective of whether its flow is initiated by a photon, secondary particle, or free radical. It may be suggested that electron ejection from any site in the net will start an electron migration to that site from labile, i.e., readily oxidizable or broken, bonds. The auxin-forming enzyme or its progenitor may be at such a locus. Or, alternatively, the disablement of a mechanism for electron transfer, a system essential to the function of the enzyme, may be the explanation for the enzymatic damage." It is further suggested that inhibition of DNA synthesis by ionizing radiation is most probably the result of the block in auxin synthesis.

48 *Sax, K. The effect of ionizing radiation on chromosomes. (pp. 15–26).*

Chiefly with reference to already-published experiments on *Tradescantia*, a review is given of the following: the types of aberrations induced by X rays and other ionizing radiations; effects on cell division; evidence concerning the nature of breakage and reunion and also the time of chromosome duplication; variation in the radiosensitivity of chromosomes at different stages of mitosis and meiosis; effect of ionization density; and modification of the frequency of aberrations at a given dose of X rays by varying the dosage intensity, fractionating the dosage, varying the temperature during irradiation, centrifuging the cells during treatment, exposure to sonic radiation simultaneously with irradiation, pretreatment or posttreatment with infrared rays, anaerobic conditions, irradiation in CO or $CO_2$, and chemical treatments.

49 *Konzak, C. F. Genetic effects of radiation on higher plants. (pp. 27–45).*

After summarizing views on the way in which energy from radiation is dissipated within the cell, the author considers the nature of genic and chromosomal mutations, applications of radiation in genetical research, the use of induced breakage in intergeneric transfers of desired loci in cereal breeding, and useful mutants of various crops obtained by workers in the USA and Europe. In conclusion he examines factors such as genotype, stage of nuclear cycle, water content of the cell, storage of irradiated seeds, chemical treatment, type of radiation, dosage rate and temperature in relation to mutational response.

50 *Gunckel, J. E. The effects of ionizing radiation on plants: morphological effects. (pp. 45–56).*

With reference to the literature and the author's own investigations, some modifications in meristems, growth habit and individual organs are described and interpreted in terms of chromosomal, cytological and physiological factors. Most of the irregularities described were probably secondary effects of physiological disturbances.

51 STOLETOV, V. N.
**(The utilization of ionizing radiation in breeding).**
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1957 : No. 3 : 6–14. [Russian].

The use of ionizing radiation in plant breeding is accepted, being regarded as a Mičurinist method of external training. The writer cites Soviet and American sources to show that the method has so far yielded little of practical value, but mentions some improved varieties of wheat, oats, barley and flax developed in Sweden.

52 VISSER, R. H.
Radiomimetisch en mutageen effect van verschillende stoffen en behandelingen op *Pisum, Allium, Beta* en *Vicia.* Onderzoekingen van Dr. von Rosen van het Hilleshög-Instituut. (**Radiomimetic and mutagenic effects of different substances and treatments on *Pisum, Allium, Beta* and *Vicia.* The investigations of Dr. von Rosen of the Hilleshög Institute**).
StudKring. PlantVeredel., Wageningen. Versl. **49** : 669–73.

A summary and discussion of a paper already summarized [XXVI, 70] are presented.

53 RÖBBELEN, G.
Untersuchungen an strahleninduzierten Blattfarbmutanten von *Arabidopsis thaliana* (L) Heynh. [**Investigations on radiation-induced mutants for leaf colour in *A. thaliana* (L.) Heynh.**].
Z. indukt. Abstamm.- u. VererbLehre 1957 : **88** : 189–252.

The majority of the 51 chlorophyll defects obtained after X irradiation were recessive, nine were partially recessive and one was dominant. They are described in detail. In some the synthesis of pigment was completely absent and these were inviable; in others the pigment formation was very much depressed and certain mutants are described in which the total pigment content was only 1·6% of that in the normal and the chlorophyll content only 6%, notwithstanding which they were viable; others with 30% of the normal chlorophyll formed fully developed seeds. On the other hand some mutants had up to 35% more chlorophyll than the normal; their growth potentialities were however not enhanced and remained below normal; no linear correlation could be established between chlorophyll content and photosynthetic activity or vigour of growth. The mutants varied also in the composition of their pigments, many of the *albina* mutants containing only small quantities of carotenoids; the *xantha* mutants contained small quantities of chlorophyll but not enough to make them viable. In many of the mutants the proportion of chlorophyll a to b was abnormally low, as was also the proportion of chlorophylls to carotene and xanthophyll. More differences were observed in the structure of the plastids than in their size or number; in some mutants the plastid structure resembled that of normal leaves grown in shade. Abnormally slow development of the chloroplasts was characteristic of many mutants and in some they failed to develop at all beyond a certain stage and later degenerated.

Some of the mutants are evidently due to chromosome aberrations, as shown by the segregation ratios in the progenies, most of which have a deficiency of recessives, though some have an excess.

Certain mutants show a block in the synthesis of pigment; thus one recessive mutant formed only protochlorophyll and no chlorophyll, while another, which was dominant, formed no chlorophyll b. Such mutants were all lethal. Most mutant genes however do not cause a block in synthesis but merely alter the proportions in which the different pigments are synthesized and the rate of synthesis. Nine of the 51 genes studied, when heterozygous, caused heterosis in respect of the leaf area after 30 days from sowing or at the end of the growing season, the heterozygotes exceeding the normal form by amounts varying from 1 to 39%. Two of these genes show superdominance for pigmentation: the heterozygotes produce more pigment than the normal form and are also more vigorous.

Some of the genes when in the heterozygous state cause an increase in certain characters and a reduction in others, for instance greater vegetative vigour and reduced seed yield; this is regarded as supporting the hypothesis that heterosis is the result of the additive effect of quantitative genes, many of which affect a given character in the same direction, at least in cross-pollinating species which are highly heterozygous; in self-pollinating organisms heterozygosis itself may, it is thought, bring about heterosis.

54 Bauman, N. & Davis, B. D.
**Selection of auxotrophic bacterial mutants through diaminopimelic acid or thymine deprival.**
Science 1957 : **126** : p. 170.

It is suggested that the penicillin technique may be replaced by a similar procedure, involving the use of diaminopimelic acid or thymine, for the detection of additional auxotrophs induced in mutants of *Escherichia coli* respectively blocked in the capacity to synthesize these growth factors. The methods described may in some cases have advantages over the penicillin procedure. In particular, the following method of producing thymine deficiency is capable of general application to micro-organisms. Use may be made of a sulphonamide antagonist of p-aminobenzoic acid to prevent the synthesis of a group of products of one-carbon metabolism, in combination with the simultaneous provision of all these products except thymine. Production of thymine deficiency in this way might be useful for selecting mutants of organisms such as yeasts which are susceptible to sulphonamides but unaffected by penicillin.

55 Ishikawa, T. & Tanaka, N.
**Effects of temperature on reversion rate of *Ustilago maydis*.**
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1957 : **70** : 183–89.

The relation between mutation rate and temperature was studied in respect of the back-mutation rate of four homocysteineless mutants. In view of the fact that mutation may occur independently of cell division, mutation rate was determined per cell per unit time instead of per generation. In three strains, mutation rate was proportional to temperature, $Q_{10}$ being respectively 1·8, 2·2 and 3·9. In the fourth strain, no simple relation between mutation rate and temperature was observed; there was, however, a mutation maximum at 20° C. The thermodynamic implications of these results are discussed.

56 Hazama, K.
**(Studies on the mechanism of the formation of floral pigments. IV. On the development of variegation).**
Ikushugaku Zasshi/Jap. J. Breeding 1957 : **6** : 205–11. [Japanese].

In the course of investigations of the genetics of floral pigmentation in *Petunia hybrida*, it was noted that somatic mutation of the gene believed to be responsible for pigmentation of the petals is highest at low temperatures when translocation of ascorbic acid from the leaves to the flowers is at a minimum.

57 Kădrev, T.
**(Some questions concerning increased vitality of the organism).**
Selskostopan. Misăl 1957 : No. 1 : 50–58. [Bulgarian].

The writer criticizes Vasileva-Drjanovska for an article which is an extension to Lysenko's theory of vitality [cf. XXIII, 847].

58 Gluščenko, I. E.
**(The phenomenon of multiparental fertilization in plants).**
Agrobiologija (Agrobiology) 1957 : No. 1 : 3–18. [Russian].

The tomato variety Želtyj Mičurina [Mičurin's Yellow], which possesses two recessive characters, determinate growth and yellow fruits, when pollinated with a mixture of pollen from two varieties, one with normal growth and yellow fruit, the other with determinate growth and red fruit, gave rise to certain plants in which both dominant characters, normal growth and red fruits, appeared; the proportion of double dominants was 31·7% in the progeny from one fruit and 59·2% in that from another. Double dominants occurred also in the $F_2$ generation, one family consisting of nothing else.

In maize, the variety Rumynskaja Belaja [Rumanian White], with round white grains, when pollinated with a mixture of two varieties, one with yellow and one with beaked grains, also gave rise to a certain number of plants combining both dominant characters, yellow and beaked; double dominants also appeared in the $F_2$ progeny of these plants. In pollinations of Sterling, with white grains, by mixed pollen of varieties possessing respectively mauve and yellow or black and yellow grains, ears containing grains of both colours were produced.

Several spring wheat crosses were made in which a variety with two recessive characters was pollinated with two parents each bearing one of the respective dominants; in one combination 47 out of 266 $F_1$ were double dominants, in a second none and in a third 27 out of 267. Similar results were obtained in crosses of *Triticum durum*. Irregular segregation was observed also in the $F_2$ of many of these crosses and double dominants occurred even in the progenies of recessive $F_1$ plants.

$F_1$ plants bearing the characters of more than one pollen parent were observed in proportions varying from 10 to 38% in mixed pollinations of *Mirabilis jalapa*. On the other hand some $F_1$ plants from white-flowered parents pollinated by coloured varieties bore only white flowers, although they did not arise apogamously. Some of the flowers displaying the characters of two pollinating varieties showed a mosaic structure when examined microscopically.

59 Osborne, R.
**Correction for regression on a secondary trait as a method of increasing the efficiency of selective breeding.**
Aust. J. biol. Sci. 1957 : **10** : 365–66.

Rendel proposed an index of selection $I = A - bB$, where $A$ is the trait undergoing selection and is correlated only environmentally with trait $B$ which has no economic value, $b$ representing the phenotypic regression of $A$ on $B$. The author examines the efficiency of the selection index when $A$ and $B$ are also correlated genetically.

60 Clark, J. B. & Webb, R. B.
**Effect of successive X-irradiation on *Nocardia corallina*.**
J. Bact. 1957 : **74** : 26–30.

Cultures grown from cells of *N. corallina* which had survived a dose of 18,000 r. were found to be more sensitive to X-irradiation than were the parent cells, maximum sensitivity being obtained after four successive irradiations of survivors. After this stage the radiation resistance increased as a result of the selection of a resistant coccoidal type of cell which was initially present as a small percentage of the total population. It is suggested that only a diploid or mixoploid population would yield such results and that they may arise from the induced segregation of a diploid or the formation of recessive lethals.

## EVOLUTION

61 Paramonov, A. A.
**(The methodology of Charles Darwin's theory).**
Izv. Akad. Nauk SSSR (News Acad. Sci. USSR) : Ser. Biol. : 1957 : No. 3 : 360–68. [Russian].

Sobol', S. L.
**(Ch. Darwin's concept of the world in the light of some new data).**
Ibid. Ser. Biol. : 1957 : No. 3 : 369–76. [Russian].

Appreciative accounts of the life and work of Darwin are given. The article by Sobol' refers to hitherto unpublished autobiographical material from a photocopy of a manuscript of Darwin's obtained from the Cambridge University Library.

62 Ehrendorfer, F.
Akzessorische Chromosomen, Kreuzungsfertilität und Polyploide beim *Achillea millefolium* - Komplex (Compositae).
**[Accessory chromosomes, cross fertility and polyploidy in the *A. millefolium* complex (Compositae)].**
Naturwissenschaften 1957 : **44** : 405–06.

In crosses of *A. asplenifolia*, which has varying numbers of isochromosomes in addition to the normal diploid set of $2n = 18$, and *A. setacea*, without isochromosomes, the fertility of the $F_1$ was greater when the isochromosomes were present in even numbers. In natural populations the diploids mostly contained isochromosomes but the polyploids did not; and it is suggested that the accessory chromosomes may serve the same function as polyploidy in reducing hybrid sterility and promoting gene exchange and hence microevolution.

63 Sharma, A. K. & Sharma, A.
**Vegetatively reproducing plants—their means of speciation.**
Sci. & Cult. 1957 : **22** : 628–30.

The author gives a review of the investigations and hypothesis referred to earlier [XXVI, 1979].

## CYTOLOGY

64 Allfrey, V. G. & Mirsky, A. E.
**The role of deoxyribonucleic acid and other polynucleotides in ATP synthesis by isolated cell nuclei.**
Proc. Nat. Acad. Sci. USA 1957 : **43** : 589–98.

Experiments on nuclei isolated from calf thymus indicated that one function of polynucleotides, including both DNA and RNA, is mediation of the aerobic synthesis of adenosine triphosphate.

The possible significance of this function from the point of view of evolutionary changes in the cell is briefly discussed.

65 VINCENT, W. S.
**Heterogeneity of nuclear ribonucleic acid.**
Science 1957 : **126** : 306–07.

By fractional extraction with HCl, the nuclear RNA of starfish oocytes has been partitioned into two components differing markedly in the relation of their specific activities to time.

66 CRICK, F. H. C.
**Nucleic acids.**
Sci. Amer. 1957 : **197** : 188–200.

Evidence relating to the structure and mode of reproduction of DNA and the relationship between DNA, chromosomes and genes is discussed in this popular article.

67 REESE, G.
Über die Polyploidiespektren in der nordsaharischen Wüstenflora. **(The polyploidy spectra in the desert flora of the northern Sahara).**
Flora, Jena 1957 : **144** : 598–634.

Data are presented on the chromosome number of 150 species indigenous for the area in question, 104 of them being determined for the first time; 7 species have numbers differing from those previously reported, the significance of which is discussed. Of the 150 species studied 37–8% were polyploid, a figure which does not exceed those for more northerly areas with less extreme conditions of climate. When certain special groups, such as halophytes, with 50·0% polyploids, hygrophytes and hydrophytes with 62·5% and oasis weeds with 45·0% are removed, the degree of polyploidy for the true desert plants amounts to 34·5%, which is distinctly below the average; among them the degree of polyploidy is higher among the perennial (42·3%) than among the annual species (28·3%). The opinion is expressed that polyploids, owing to their greater range of adaptation, tend to be in the excess in regions that have been recently colonized, such as the postglacial areas of Europe, and that in the course of time the proportion gradually diminishes to a minimum roughly corresponding to the figure found today in the Sahara flora, which is the impoverished relic of an ancient and much richer vegetation.

68 SHARMA, A. K. & SHARMA, A.
**Permanent smears of leaf tips for the study of chromosomes.**
Stain Tech. 1957 : **32** : 167–69.

This method may be used with either young leaf tips or young stem tips. The material is treated with saturated aqueous esculin at 10–12° C. for 15 min. to 24 hr., fixed in 1 : 1 acetic alcohol, for at least three hours but not more than 24 hr., and heated for three to four seconds in a 9 : 1 mixture of 2% acetoorcein and 1 N HCl. It is left in this mixture at 30° C. for at least 30 min. and then smeared on a dry slide in 1% acetoorcein. Slides prepared in this way retain their colour for 15 days or may be made permanent by mounting in Canada balsam. In plants with high chromosome numbers the substitution of esculin by a saturated solution of coumarin or paradichlorobenzene is recommended.

69 TAYLOR, J. H.
**The time and mode of duplication of chromosomes.**
Amer. Nat. 1957 : **91** : No. 859 : 209–22.

After reviewing and discussing the evidence for the limitation of DNA synthesis to the interphase stage of the cell division cycle the author considers the relation between DNA synthesis and chromosome duplication and concludes that they occur simultaneously and are probably part of the same sequence of events. A model for the structure of chromosomes is proposed on the basis of results obtained from studies using tritium-labelled thymidine [cf. XXVII, 2508].

70 SERMONTI, G.
Genetica del *Penicillium chrysogenum*. I. Eterocariosi in *Penicillium chrysogenum*. II. Segregazione e ricombinazione da un diploide eterozygote in *P. chrysogenum* Thom. **(Genetics of *P. chrysogenum*. I. Heterocaryosis in *P. chrysogenum*. II. Segregation and recombination from a diploid heterozygote of *P. chrysogenum* Thom.).**
RC Ist. sup. Sanit. 1954 : **17** : 1330–61.

In the first of these contributions the author describes a technique for producing heterocaryons between mutant strains of the above fungus with complementary nutritional requirements by plating mixed cultures on minimum media. Plating of conidia from mixed colonies on to fully supplemented media gives rise to colonies of both parental types but the heterocaryons can be preserved by transfer of vegetative mycelia. In the second paper a diploid heterocaryon produced by this technique is described. Some segregation for nutritional requirements was found among the progeny of this diploid but no recombination was shown until the second generation. These results are taken to confirm the process of parasexual recombination in this fungus.

71 Tschermak-Woess, E.
Über Kernstrukturen in den endopolyploiden Antipoden von *Clivia miniata*. **(On the nuclear structure of the endopolyploid antipodals of *C. miniata*).**
Chromosoma 1957 : **8** : 637–49.

Antipodal cells in *C. miniata* ($n = 11$) become 32-ploid by successive endomitoses. The daughter chromosomes usually remain loosely attached at the heterochromatic region only, giving 11 diffuse endochromocentres, but may remain loosely joined along their whole length, giving 11 giant chromosomes.

72 Sawamura, S.
**(Plant material suitable for investigating mitosis *in vivo*).**
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1956 : **69** : 30–33. [Japanese].

A method of mounting cells from the petals of *Allium fistulosum* or from the stipules of *Vicia faba* for observing mitosis *in vivo* is described.

73 Sachs, R. M. & Lang, A.
**Effect of gibberellin on cell division in *Hyoscyamus*.**
Science 1957 : **125** : 1144–45.

An injected dose of 5 μg. of gibberellin per plant of *H. niger* resulted in an increase in cell division in the subapical region of the shoot, longitudinally-oriented figures of division being much more frequent than transverse ones.

74 Das, N. K.
**Initiation of DNA synthesis, mitosis, and cell division by kinetin and indoleacetic acid in excised tobacco pith tissue.**
Diss. Abstr. 1957 : **17** : Publ. No. 20,623 : 955–56. (Abst.).

[Cf. XXVII, 1146].

75 Rotini, O. T., Marino, G.
**The antimitotic activity of cyanates on the bulbs of *Allium cepa* L.**
Arch. Biochem. Biophys. 1957 : **69** : 346–52.

KCNO solutions had a markedly inhibitory effect upon preprophase. This effect corresponds with the retarding action of cyanates upon cytochrome-containing enzymes such as the catalases active during preprophase.

76 Takatori, S.
**The effects of phosphates on mitosis.**
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1956 : **69** : 103–11.

Mitotic aberrations, in particular X-shaped chromosomes, induced in root-tip cells of *Allium cepa* by immersion in phosphate solutions are described. No evidence of somatic meiosis was obtained.

77 Garrigues, R.
Premiers essais de l'action de l'acide disuccinoyl-peroxydique sur les racines de *Vicia faba* L. **(Preliminary experiments on the action of disuccinoyl peroxidic acid on the roots of *V. faba* L.).**
Rev. Cytol., Paris 1957 : **18** : 105–23.

The effects of the above compound upon roots subjected to concentrations of 1/10,000 to 1/1000 for two days include total cessation of growth at the highest concentration, abnormalities of cell division and chromosome structure, these being least marked at the lowest concentration, and, at concentrations of 1/4000 to 1/10,000, death of the outer cortical cells.

78 Schreiber, R. W.
**A cytological analysis of the antimetabolite activity of 5-hydroxyuracil in *Vicia faba* roots.**
Diss. Abstr. 1956 : **16** : Publ. No. 18, 447: 1784–85.

The effects of 5-hydroxyuracil on root elongation, mitosis and DNA synthesis were investigated. Mitosis was inhibited after 12 hr. of treatment, normal after 24 hr., inhibited after 36 hr. and normal after 48, 60 and 72 hr. of treatment. In roots treated for 6 hr. a single heightened peak representing the 2C amount was evident in the curve for DNA synthesis; after 12 hr., the 2C and 4C peaks were approximately equal, as in the control pattern of DNA synthesis; after 24 hr. a single heightened peak in the intermediate region of the curve was obtained; with 36 hr. of treatment the 2C and 4C peaks were approximately equal. Treatment with 5-hydroxyuracil in combination with thymidine or uridine resulted in less severe effects on mitosis and DNA synthesis than those of treatment with 5-hydroxyuracil alone; thymine and uracil do not modify the effects of the latter chemical.

79 Chandler, A. C. (Jun.)
**The immediate effects of low doses of X-radiation on the frequency of several mitotic stages in the Allium root tip.**
Biol. Bull. 1957 : **112** : 305–12.

A study was made of the effects of treating roots of seedlings with 128 r. or 512 r., the frequencies of the different mitotic stages being determined 0–5 hr. after irradiation and the temperature being maintained at 32° C. before and after treatment. Late prophase was the stage most sensitive to inhibition by X rays and early prophase the second most sensitive stage.

80 Webb, R. B. & Clark, J. B.
**Cytogenetic study of *Nocardia corallina.***
J. Bact. 1957 : **74** : 31–41.

The correlation of cytological and radiobiological findings indicates that in the above bacterium a diploid coccoidal stage gives rise to a cenocytic diploid hyphal stage which divides by nuclear reduction division to form haploid bacillary cells containing two nuclei which fuse to give rise to the diploid coccoidal stage. A haploid chromosome number of three is suggested for this organism. [cf. Abst. 60].

81 Craveri, R. & Veronesi, U.
**Effect of actinomycin M upon mitosis.**
Nature, Lond. 1957 : **179** : 1306–07.

Investigations on roots of *Allium cepa* and on various types of animal tissues showed that actinomycin M retards the initial phases of mitosis and that the substance may be classified as radiomimetic from its effects on chromosomes. Unlike actinomycin C, it had no effects on the spindle.

82 Chance, H. L.
**Nuclear division in *Escherichia coli* as revealed by acid fuchsin.**
J. Bact. 1957 : **74** : 67–70.

It is reported that the behavioural pattern of stained material of *E. coli* could be arranged in a sequence simulating that found in higher plants and animals and although chromosomes could not be definitely identified a structure which divided longitudinally was observed. Some of the material suggested more than one pattern of division.

83 Kihlman, B. A.
**Experimentally induced chromosome aberrations in plants. I. The production of chromosome aberrations by cyanide and other heavy metal complexing agents.**
J. biophys. biochem. Cyt. 1957 : **3** : 363–80.

Kihlman, B. A., Merz, T. & Swanson, C. P.
**Experimentally induced chromosome aberrations in plants. II. The effect of cyanide and other heavy metal complexing agents on the production of chromosome aberrations by X-rays.**
Ibid. 1957 : **3** : 381–90.

It was confirmed that potassium cyanide causes chromosome aberrations in root-tip cells of *Vicia faba* [cf. XXVI, 1995]. The effect was found in early interphase and the breaks tended to be concentrated in the heterochromatic segments. The frequency of aberration was found to be directly related to the oxygen tension. Other heavy metal complexing agents were found to have similar effects, but there was no correlation between ability to inhibit catalase and peroxidase and ability to cause chromosome aberrations.

It was also confirmed that potassium cyanide increases the production of chromosome aberrations by X rays in nitrogen, but has no effect in air [cf. XXVI, 1995]. The increased breakage was of the X-ray type. Cupferron produced similar effects.

It was concluded that accumulated peroxides were not involved in the production of chromosome breaks by cyanide. It was suggested that heavy metals are present in the chromosome and heavy metal complexing reagents react with these to produce aberrations.

84 Sharma, A. K. & Sarkar, S. K.
**A study of the comparative effect of chemicals on chromosomes of roots, pollen mother cells and pollen grains.**
Proc. Indian Acad. Sci 1957 : **45** : 288–93.

In investigations on *Nothoscordum fragrans*, treatment with esculin, p-dichlorobenzene or resorcinol caused fragmentation and erosion of the chromosomes in root-tip cells, formation of diplochromosomes in the pollen grains, and irregularities such as lagging, nondisjunction and stickiness in meiotic cells. The differences between the responses of the root-tip cells on the one hand and pollen grains and pollen-mother cells on the other are ascribed to disparities in chromosome metabolism.

85 Barthelmess, A.
Chemisch induzierte multipolare Mitosen. (**Chemically induced multipolar mitoses**).
Protoplasma 1957 : **48** : 546–61.

Immersion of growing roots of *Allium cepa* in ethanol and other primary saturated aliphatic alcohols led to the disturbance of the equatorial plate at metaphase and the failure of one or more chromosomes to assume the normal position on it; this seems to be the result of partial or total inactivation of the centromere of these chromosomes during the prometaphase stage. The frequency of bipolar mitoses was also increased and at anaphase the number of poles increased, up to eight and more being observed after 4 hr. treatment with ethanol concentrations of 0·65–1·1 mol. The disturbances can result in multinuclear cells and a number of hypoploid cells with the most varied genomic constitution, which in polyploid organisms could produce a wide range of genotypic variation of evolutionary significance.

Higher concentrations produced phenomena of stickiness but no true c-mitotic effects and the effect of the alcohols is considered to be a disturbance of the orientating capacity of the spindle mechanism whereas c-mitotic substances affect the whole spindle structure and inhibit chromosome movement. The terms alcohol mitosis and merocinesis are proposed to denote the effects of alcohol here described.

86 Kirby-Smith, J. S. & Craig, D. L.
**The induction of chromosome aberrations in Tradescantia by ultraviolet radiation.**
Genetics 1957 : **42** : 176–87.

Investigation of the time-intensity relationship revealed that the intensity of the ultraviolet radiation to which dry pollen of *T. paludosa* was exposed could be varied by at least a factor of 10 without any change in the frequencies of one-hit aberrations. Two-hit aberrations were too infrequent for practical study. The over-all frequencies of aberrations (chromatid and isochromatid) induced by irradiation in air and N did not differ significantly. Within the isochromatid class, the number of incompletely restituted breaks caused by treatment in N was higher than that produced by irradiation in air. No photorecovery of chromosomal damage occurred. The curve showing breakage as a function of wave length was in good agreement with a nucleic-acid absorption spectrum obtained by Hollaender *et al.*

87 Bora, K. C.
**Comparison of cytologic effects produced by 220 kVp roentgen rays, radioiridium Ir$^{192}$ gamma rays and 30 MeVp roentgen rays in the microspores of *Tradescantia bracteata.***
Acta radiol., Stockh. 1955 : **44** : 129–44.

"The relative biologic efficiency of filtered 220 kVp roentgen rays from a Maximar therapy machine, gamma rays of mean energy 0·4 MeV from radioiridium (Ir$^{192}$), and filtered and pulsed 30 MeVp roentgen rays from the synchrotron, in producing chromosomal aberrations in the microspores of *Tradescantia bracteata* (clones 20$^{2}$ and 21$^{3}$) have been determined at several dosage levels. At low levels (100 to 500 r.), equal doses of 30 MeVp roentgen rays and 0·4 MeV gamma rays produce equal frequencies of chromosomal aberrations but, at higher dosages (600 to 1000 r.), the same dose of the former radiation produces consistently lower frequencies of all types of aberration."

[Author's summary]

88 de Groote, R.
Polyploïdie des plantes par gammexane. (**Polyploidy in plants by means of gammexane**).
Bull. Hort., Liège 1957 : **12** : 247–48.

This short article summarizes research on the induction of polyploidy by $\gamma$-benzene hexachloride [cf. XIX, 790 and XX, 100, 107 and 401].

89 Hirota, Y. & Iijima, T.
**Acriflavine as an effective agent for eliminating F-factor in *Escherichia coli* K-12.**
Nature, Lond. 1957 : **180** : 655–66.

The culture of F$^{+}$ cells on a nutrient broth containing a sublethal dose of acriflavine proved a more effective means of converting F$^{+}$ cells to F$^{-}$ than treatment with cobalt or nickel [cf. XXVII, 43]. The efficiency of conversion was reduced when a minimum medium was used instead of broth. Intermediate strains (Fi) were also obtained, which were fertile with F$^{-}$ strains and highly fertile with F$^{+}$. Hfr$^{-}$ strains resembling F$^{-}$ in compatibility and fertility and a strain Hfr–i resembling F$^{+}$ were induced by cobalt or acriflavine treatment of Hfr (Hayes's strain).

90 Takemaru, T.
(**Genetics of *Collybia velutipes.* IV. "Interpolarity" in strain NL-55**).
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1957 : **70** : 238–43. [Japanese].

Normal fruiting bodies are not formed from the illegitimate combination A$^{1}$B$^{1}$ x A$^{1}$B$^{2}$ but are freely formed from A$^{2}$B$^{1}$ x A$^{2}$B$^{2}$. This phenomenon is termed interpolarity.

91 Takemaru, T.
(**Genetics of *Collybia velutipes.* V. Mating patterns in the F$_{1}$ between NL-55 strains**).
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1957 : **70** : 244–49. [Japanese].

Further to the preceding paper [cf. 90], the author reports that F$_{1}$ monosporous mycelia of legitimate matings showed either tetrapolar or interpolar mating patterns while F$_{1}$ mycelia from illegitimate matings were tetrapolar. It is postulated that the *A* incompatibility locus is composite, consisting of at least two linked loci.

92 Ajzenštat, Ja. S. & Šipilova, I. I.
**(Descriptions of pollen germination at different ages of the flower in tomatoes and peas).**
Dokl. vsesojuzn. Akad. sel'skohozjajstv. Nauk Lenin. (Proc. Lenin Acad. agric. Sci.) 1957 : No. 3 : 29–32. [Russian].

The number of germinating pollen grains and growing pollen tubes in the tomato hybrid combination Golden x Budenyj and the pea cross Neistoščimyj [Inexhaustible] x Olivkovyj [Olive] varied according to the time of pollination; in tomatoes the pollen did not grow until 3–4 days had elapsed after the flowers had opened or even later than this, but in peas the pollen grew well on the day the flowers opened till 6–7 days afterwards.

93 Poljakov, I. M.
**(Using labelled pollen in studies of fertilization problems).**
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1957 : No. 3 : 14–22. [Russian].

Investigations of fertilization processes in various economic plants by means of pollen labelled with $P^{32}$ or $S^{35}$ have been continued [cf. XXVII, 3733]. This report deals mostly with fertilization of cotton and maize by unlabelled pollen from the mother variety and by labelled pollen of another variety, 6, 12 or 24 hr. later. A surprisingly large amount of radioactive isotopes occurred in the seed of this material and it is suggested that much of it must have reached the ovules and later the seed from the placenta as a result of metabolic diffusion.

Rough estimates of the total number of pollen tubes transmitting radioactive isotopes to one maize grain are made for a number of varieties. Descriptions are given of the chemical nature of compounds in the pollen and seed of *Nicotiana rustica* which carry radioactive material and of the distribution of $S^{35}$ in the style and ovary of *N. tabacum*, 12, 18, 24, 36, 48, 60 and 74 hr. after fertilization.

94 Matsumura, M.
**(Changes in the respiratory activity of the ovaries of *Lilium speciosum* Thunb. caused by fertilization).**
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1957 : **70** : 137–40. [Japanese].

Oxygen uptake and the respiratory quotient of the ovaries both rose sharply 90 hours after pollination, about the time when the gametes conjugated.

## CROP PLANTS

Huitième Congrès International de Botanique, Paris 1954. Rapports et communications déposés lors du congrès dans les sections 13 et 14. **(Eighth International Botanical Congress, Paris, 1954. Reports and Communications presented during the Congress in sections 13 and 14).** Pp. 101 and 39.

Section 13 deals with forestry and section 14 with some economic plants.

*Section 13*

95 *Ferré, Y. de. Résistance de quelques espèces de* Pseudotsuga *au* Phaeocryptopus gaumanni *(Rohde) Patrak. [Resistance of some species of* Pseudotsuga *to* Ph. gaumanni *(Rohde) Petrak]. (pp. 2–5).*

Some variation in susceptibility to *Ph. gaumanni* was found in lines of *Ps. douglasii* at Jouèou; one line appeared to be completely resistant.

96 *Pravdine, L. F. Le greffage des espèces arborescentes conifères et son importance dans la sélection. (The grafting of species of coniferous trees and its importance in breeding). (pp. 6–8).*

Some account is given of the mutual effects of scion and rootstock, found both in intraspecific and interspecific grafts. Scions from mature plants grafted on to young plants produced fruit within two or three years; the shortness of these trees facilitates artificial pollination.

97 *Hyun, S. K. Application du doublement des chromosomes à l'amélioration des arbres forestiers. (The application of chromosome doubling to the improvement of forest trees). (pp. 8–12).*

Techniques which are used in producing artificial polyploids are briefly described. Data are provided on some *Pinus* polyploids obtained by means of colchicine treatment [cf. XXIV, 2481].

98 *Jamblinne de Meux, A. de. Variation inter et intraspécifique des processus de maturation des fleurs dans le genre* Pinus. *(Note préliminaire). [Inter and intraspecific variation in the maturation process of flowers in the genus* Pinus *(preliminary note)]. (pp. 12–15).*

The order of flowering in a season was determined for nine species of *Pinus* including thirteen ecotypes of *P. sylvestris* and seven of *P. nigra*.

99 *Chapot, H. & Schwob, R. Essences d'agrumes et systématique des espèces du genre* Citrus. (*Citrus fruit essential oils and systematics of species of the genus* Citrus). (*pp. 6–9*).

A classification based on the physical and chemical properties of the essential oils extracted from citrus rinds was found to agree with a morphological classification formulated by the same authors.

Some varieties formerly attributed to *C. aurantifolia* are rejected from that species and suggestions are made concerning their true origin.

100 *Clavier, C. Résumé sur les travaux d'amélioration du ricin effectués au Centre de Recherches Agronomiques du Maroc.* (*A summary of the work on improving castor oil plant accomplished at the Morocco Centre of Agronomic Research*). (*pp. 16–17*).

Local varieties were found to be perennial and to belong to the following groups: *Ricinus communis* vars. *major*, *leucocarpus* and *effusus*, *R. persicus* and *R. zanzibarensis*. These groups are interfertile and a series of intermediates exist. No differences were found in the mitoses and meioses of local and introduced forms. The somatic chromosome number was found to be twenty; statistical studies gave no evidence of polyploidy with five as the basic number.

Of the local varieties, Rouge de Fès [Fès Red] and Oued Beth have been found most productive. Selections from Palestinian introductions are being investigated. The American varieties Cimarron, Blackwell and Conner and the local selection 930 CRA were found suitable for annual cultivation.

**Proceedings of the Eleventh International Seed Testing Convention held in Paris June 4th-7th, 1956.** Pp. 578.

101 *Miguel, M.C.C. Varieties of "tronchuda" or veined cabbages.* (*pp. 149–62*).

The following Portuguese cabbage varieties of which seed is now being exported are described: Penca de Chaves [Chaves Stalked], Tronchuda Portuguesa [Portuguese Stalked], Penca da Póvoa [Póvoa Stalked], Tronchuda Glórie de Portugal [Glory of Portugal Stalked], and Murça.

102 *Yamasaki, M. On the identification of plant characters by testing the resistance of seeds to the toxic action of potassium chlorate.* (*pp. 175–79*).

The work reviewed in this paper has already been summarized from another source [XXIV, 954].

103 *Eifrig, H. Untersuchungen über Erhaltung der Keimfähigkeit von Beta-Samen.* (*Investigations on the retention of germination capacity in beet seeds*). (*pp. 269–75*).

At the Agricultural Institute, Westfalen-Lippe, germination of the mangels Eckendorfer gelb [Eckendorf Yellow] and Eckendorfer rot [Eckendorf Red] and the sugar beet Gbr. Dippe types E and N was compared.

104 Sánchez-Monge, E.
De la planta cultivada actual a la del futuro. (**From the present cultivated plant to that of the future**).
Agricultura, Madr. 1957 : **26** : 323–30.

A popular description is given of the principles of plant breeding with special reference to hybridization, back crossing, wide crossing, utilization of heterosis, polyploidy and induced mutation.

105 Ruiz Santaella, J.
De la planta silvestre a la planta cultivada. (**From wild plant to cultivated plant**).
Agricultura, Madr. 1957 : **26** : 377–80.

In this popular article the role of mutation, selection, hybridization and isolation in the origin of cultivated plants and the main features that distinguish them from their wild progenitors are analysed. The sweet lupin is quoted as an example of a new crop that originated by the direct application of the law of homologous variation.

**The Research and Experimental Record of the Ministry of Agriculture, Northern Ireland 1957 : 5 : P. 197.**

The results are reported of trials of varieties of Brussels sprout and tomato carried out at Loughgall, Co. Armagh.

106 *Coey, W. E., Smyth, W. G. & Smyth, J. V. The value of discard rows in field experiments with barley.* (*pp. 7–11*).

Differences between outer and inner rows of plots are affected both by variety and seed rate. It is therefore necessary in field trials to harvest the outer rows separately and discard them.

107 *Reports from research divisions for 1955.* (*pp. 83–160*).

**Oats.** Breeding for mildew resistance has continued and the rod-row test of 17 hybrid selections was repeated [cf. XXVII, 2572]. Variety trials have been carried out.

***Lolium.*** A replicated clonal trial of 550 plants has been set up and selection of outstanding lines has yielded 82 plants which will be used for polycrossing. Progeny testing has continued and three progenies in one trial have significantly outyielded the control in total green herbage weight, one of them also showing significantly less rust than S24. A trial including lines from the USA, England, Belgium and Eire has been set up and under Northern Ireland conditions the introduced strains Oregon Blue Tag and Oregon Commercial were found to be markedly inferior. Observations on the phenotypic appearance and fluorescence of 200 seedlings of perennial ryegrass indicate that fluorescence can occur independently of other Italian ryegrass characteristics and that the presence of fluorescent seedlings in a sample of perennial ryegrass is not necessarily an indication of contamination by Italian ryegrass.

**Potato.** Crossing wild lines of *Solanum andigenum* with varieties of *S. tuberosum* is being carried out with a view to developing strains resistant to *Heterodera rostochiensis*. Out of 73 isolates of *Phytophthora infestans* collected from commercial varieties in Northern Ireland 70 were found to be of race 4 and a total of seven races was found on commercial varieties and experimental hybrids. Some seedlings have been found in grafting tests to possess field immunity to viruses X, A and X + B. Detailed results are also given of yield trials of 24 varieties.

**Flax.** The back-cross programme referred to earlier [XXVII, 2572] has been completed and selections breeding true for resistance to *Polyspora lini* are to be tested for fibre yield and quality, lodging resistance and other characters. New crosses have been made among Dutch, Russian, Irish and American strains and the production of two or three generations in one season by the use of artificial light is to be attempted in order to speed up breeding. The results of a variety trial including three Netherlands varieties are tabulated. Some evidence has been obtained that different cultures of *P. lini* may bring about different degrees of infection on one or more varieties while showing no difference in level of attack on other varieties. No variety has so far been found to be susceptible to one culture and immune to another. About 200 oil and fibre varieties have undergone field and pot tests to determine their reaction to *Fusarium lini*. Redwing showed no infection in the field and Concordia, Norfolk Queen, Pinnacle, Poland 210 and Stormont Cirrus showed a high level of resistance. A number of $F_4$ plants from crosses between Redwing and several fibre varieties have been selected for wilt resistance and other characters but none are so satisfactory as Liral Prince or Stormont Gossamer when grown in uncontaminated soil.

108 **Thirty-Seventh Report and Accounts of the National Institute of Agricultural Botany, Cambridge 1956** : Pp. 60.

Trials have been carried out with maize, rye, forage grasses, lucerne, red clover, sainfoin, lupin, mangel, swede, rape, linseed, kale, lettuce and sweet corn.

**Wheat.** In preliminary trials 21 winter varieties and nine spring varieties were tested at some or all of 19 localities.

**Oats.** The winter-oat trials were devoted to testing selections from the Cambridge Plant Breeding Institute and the Welsh Plant Breeding Station. In the spring oat trials, 16 varieties were compared with Sun II.

**Barley.** In the main spring barley trials, eight varieties were compared with Proctor.

**Potato.** In the maincrop trials, Ulster Torch remained almost free of blight for several weeks after the other varieties in the trial had been killed. Among second-early varieties, Craigs Alliance and Arran Pilot showed least discoloration of the cut surface of raw tubers while King Edward and Ulster Torch were the best of the maincrop varieties in this respect. Other trials are also briefly reported. Ulster Tarn and 480/50 appear to possess a high degree of field resistance to both the leaf-roll virus and virus Y. Only two varieties, Ulster Prince and Ulster Premier, gave necrotic symptoms when infected by the tobacco veinal necrosis virus. Kennebec and Pungo were found to be resistant to four races of *Phytophthora infestans*, namely 0, 2, 2·4 and 4 and possibly also to race 3·4, while Saco was resistant to races 0, 2 and 4.

**Sugar beet.** In trials of commercial strains Hilleshög N, Sharpe's Klein E, Hilleshög E and Hilleshög Polyploid gave the highest yields of sugar and some indication was obtained that polyploid strains were more susceptible than diploid to damage by mergamma. In early sown trials KNB continued to show the highest bolting resistance.

**Carrot.** The varieties so far examined have now been placed in 10 main groups on the basis of root shape and quality.

**Onion.** A total of 120 varieties have been classified on the basis of shape and colour into 11 main types, which are described.

**Cabbage.** Best of All was again the earliest Savoy cabbage and was superior in quality and yield to all other varieties. Early Covent Garden gave high yields of loose heads.

**Cauliflower.** Seal-Hayne Extra Early Roscoff was markedly superior in quality in the extra early group, Trevean Second in the No. 1 period trials and SH21/4/24 in the No. 2 period trials. Seven varieties were included in the summer cauliflower trials.

**Brussels sprout.** Trials were conducted at eight centres to compare some of the Glasnevin varieties with each other and a commercial control in respect of their suitability for market picking or quick freezing.

**Tomato.** It was noted that three American varieties, Rutgers, Urbana and Jefferson, were more susceptible to blight than the English and Dutch varieties included in the trial.

**Broad bean.** Throws MS continued to show promise in a trial of 32 winter varieties at 10 centres. It was again noted that yields were slightly increased by using seed from plants exposed to cross pollination.

109 **Guide to varieties of field and vegetable crops under trial, observation and propagation.**
Nat. Inst. agric. Bot. 1957 : Pp. 71.

This booklet gives information on the variety trials, observation plots and other experiments being carried out on field and vegetable crops at the Cambridge headquarters of the institute and subsidiary stations in England, Wales and Scotland. Part 5 lists the pedigrees and places of origin of the cereal varieties under trial or multiplication.

110 Könnecke, G.
Forschungsaufgaben und Feldversuche 1953–1955 des Institutes für Acker- und Pflanzenbau der Martin-Luther-Universität Halle-Wittenberg. (**Research problems and results of field tests in 1953-55 at the Institute for Field and Crop Cultivation of the Martin Luther University, Halle-Wittenberg**). Undated : Pp. 382.

**Wheat.** The best of all the winter wheats tested was Hadmerslebener VIII, which has a high tillering capacity and is resistant to mildew, lodging and shedding but somewhat low in baking quality. Hochland [Highland] is winter hardy and has so far given good yields. Bastard II [Hybrid II] also combines good grain yield with winter hardiness but is susceptible to mildew.

The rye-wheat hybrid Salzmünder Stamm 14/44 [Salzmünde Strain 14/44] has given yields equal to the best varieties tested, is hardy, disease resistant, low in cultural requirements and is not damaged by wild boars but is somewhat difficult to thresh and low in baking quality. It is being released under the name Salzmünder Bartweizen [Salzmünde Beard wheat].

Among the spring wheats the best yields of both grain and straw were given by Peko, whereas Koga was the best in quality.

**Oats.** Little difference was observed between the varieties in respect of yielding ability, the most suitable for central Germany being Flämingsgold, characterized by regularity of yield, high straw yield and low husk percentage, Svalöf Golden Rain III, which is the best in standing capacity, and Flämingsweiss II [(Lochows gelb [Lochow's Yellow] x Victory) x Flämingsgold], which is distinguished also by standing capacity and good yields of grain and straw. Hadmerslebener Auswuchsfester gelb [Hadmersleben Sprouting-resistant Yellow] is mentioned for its freedom from sprouting.

**Rye.** None of the newer diploid varieties under observation has so far excelled Petkus winter rye. Tetraploid Petkus is distinguished by shorter straw and better standing capacity but in grain yield has been inferior on all but the richest soils, where it has equalled and occasionally slightly surpassed the diploid. With high N doses of up to 120 kg. per ha. it gives very high yields of fodder, the protein content of which is higher than that of normal Petkus.

**Maize.** Yields of 40·6 c. per ha. were obtained from hybrid maize compared with 30·8–38·4 c. from the local varieties.

**Barley.** On the basis of four-year yield tests the Kleinwanzleben variety Rekord has proved much the best of all winter barleys and has distinguished itself by its short straw and high standing capacity, though in winter hardiness it is inferior to the next best variety Mahndorfer and ripens a few days later.

A new variety Askania, from Friedrichswerther Berg x Mie, described as midearly and resistant to smut, mildew, leaf stripe (*Helminthosporium*) and frost, was only 1% below Rekord in yield in the period 1952–54.

The new winter barley Gutta from Kleinwanzleben, an X-ray mutant of Peragis Mittelfrühe II [Peragis Medium-early II], is roughly equal to Askania in yield but somewhat less hardy.

Friedrichswerther MF, a hybrid of Friedrichswerther Berg x Stiza-Nagie, has surpassed Friedrichswerther Berg in yield and earliness and is very winter hardy; it may be added to the approved varieties. Dr. Mausberg's winter barley, though drought resistant, has not proved worthy of further trial.

Among the spring malting barleys Freya proved the best, though it is not sufficiently resistant to mildew, in which respect some of the new hybrids under observation are more promising. Other good varieties were Elsa for good soils and Saale for poor, this last-named having the lowest protein content of all varieties tested; it is however susceptible to mildew and lodging.

**Forage legumes.** The Ettersberger spring vetch is mentioned for its tolerance of low fertility and drought and the new variety Rügener seems promising on account of its high yield of green matter.

The lupin Gülzower Süsse Gelbe [Gülzow Sweet Yellow] exceeded Weiko III in yield of both green matter and seeds; its pods are hairy but do not dehisce.

The soya bean Dornburger Weissblühende [Dornburg White-flowering] has given regular yields. Though Heimkraft has been replaced by Heimkraft II it is being retained in the tests on account of its earliness.

**Potato.** The varieties Frühbote [Early Messenger], Mittelfrühe [Medium-early] and Ackersegen [Field's Blessing] have proved the most regular in their yields. Drossel [Thrush] had the lowest virus attack among the early varieties, Meise [Titmouse], Fink [Finch] and Cornelia among the midearly group, Sanita and Aquila in the midlate and Kleinwanzlebener Stamm 448/45 [Kleinwanzleben Strain 448/45], Star [Starling] and Capella in the late.

In respect of tuber yield the best varieties were Frühmölle in the early group, Frühnudel in the midearly, Nova in the midlate and Capella and Mira in the late.

Among the new varieties Anemone is mentioned for its combination of earliness and virus resistance, Argo [Argus] for high yield and starch content, virus tolerance, resistance to the Giesshübel wart biotype and good quality, Schwalbe [Swallow] for high virus resistance and Zeisig [Siskin] for resistance to all known wart biotypes.

A table is given showing the properties of all the best varieties arranged in maturity groups.

**Willow.** Tests of a number of varieties showed Mulattin [Mulatto] and Türkenberger to be the most suited to drier areas and Kottenheider and Ulbrich for moist; Universal had the greatest number of twigs and received the highest marks for quality in the first year but was surpassed in the later years by Kottenheider, which is recommended as a variety combining high yield and quality.

**Beans.** Bauernfreude [Peasant's Joy] and Dornburger Weisse [Dornburg White] were the best haricot beans.

The new field bean Dornburger is taller and higher in protein content than other varieties, ripening a few days later. Rastatter Kleinkörnige [Rastatt Small-seeded] is resistant to aphids and has also given good yields of grain.

**Peas.** Nordsaat [Northern Seed] gave the highest yields over the three-year period and Waldmanns Goldkugel [Waldmann's Golden Ball] had the largest seeds, the thinnest skin and the highest quality among the peas for drying. In the green peas Diadem is mentioned for high yield among the early marrowfat varieties, Maiperle [May Pearl] and Onsa among the ordinary early varieties; the latter is resistant to foot rots; Maiwunder [May Wonder] and Rapid are mentioned for earliness. In the later group Brunsviga and the marrowfat Hada are mentioned for high yields and Salzmünder Edelperle [Salzmünde Noble Pearl] for regular yields of small marrowfat peas suitable for canning.

In the field peas the best combination of green matter and seed yield was given by Waldmanns Futterfreude [Waldmann's Fodder Joy], a form of *Pisum sativum* from the cross Kleine Rheinländerin [Little Rhineland Maid] x Mahndorfer, followed by Hödinger, which is a pronounced *P. arvense* type. The highest seed yield was given by Zeiners Kurz und Gut [Zeiner's Short and Good], which is resistant to foot rots.

111 BATTISTELLI, E.
Importanza delle razze e delle sementi elette. **(The importance of variety and of selected seed).**
Sementi elette 1957 : **3** : No. **4** : 58–62.

The opinion is expressed that Italian farmers pay more attention to manuring and mechanization than to quality and authenticity of seed; by growing varieties that respond to improved conditions they would get more benefits in yield.

Jahrbuch 1956 der Bundesanstalt für Pflanzenbau und Samenprüfung in Wien. **(1956 year book of the Federal Institute for Plant Cultivation and Seed Testing, Vienna).**
Bodenkultur 1957 : 8.Sonderheft : Pp. 196.

112 *Bauer, R. Tätigkeitsbericht 1956. (Report on work in 1956). (pp. 16–31).*

The results of varietal trials with the following crops are briefly reported: wheat, oats, rye, maize, barley, leguminous forage plants, potato and sugar beet.

113 *Waltl, K. Tätigkeitsbericht der Qualitätsabteilung. (Report on the work of the Quality Department). (pp. 71–81).*

Information is given on the influence of the climate on the baking quality of some winter and spring wheat varieties, tested at a number of centres throughout Austria.

114 *Nietsch, H. Botanische Sortenbeschreibungen. (Botanical descriptions of varieties). (pp. 89–103).*

Comprehensive data are provided on morphological characteristics of recent varieties of wheat, oats, rye and barley grown in Austria. Each of the varieties described is illustrated.

115 *Pammer, F. Rotklee und Kleegras. (Red clover and clover pasture). (pp. 159–82).*

The results are presented of trials held in Austria during 1953–56 with varieties of red clover from eight European countries.

116 ENKEN, V. B., DAVYDOV, N. N., GURŽIEVA, A. V. & GALEEV, G. S. **(Novelties of plant breeding).** Bjull. vsesojuzn. Inst. Rasten. (Bull. All-Un. Inst. Pl.-Industr.) 1956 : No. 1 : 27–30. [Russian].

The hybrids described include: the winter wheat VIR–463 [Institute of Plant Industry 463], from VIR–4 x Skorospelka L–1 [Early L–1], which matures 4–5 days before Novoukrainka 83, is resistant to yellow and black stem rust and good in baking quality and with yields of 34·2 c. per ha. has exceeded Novoukrainka 83 by 6–7 c.

The double-cross maize hybrid VIR–281 from (VIR–44 x VIR–40) x (VIR–29 x VIR–116), a dent type, is possessed of medium stature and standing capacity, ripens together with VIR–42 and has yielded up to 11·4 c. more grain per ha., especially in dry years. The double-cross dent hybrid VIR–264, from (VIR–44 x VIR–38) x (VIR–29 x VIR–116), is 3–4 days later than VIR–42, stands well but is less resistant to smut; it has surpassed VIR–42 in yield of grain by up to 8 c. per ha.

The chickpea Sovhoznyj 14, a selection from the cross Kuban' 163 x Kuban' 199, is resistant to *Ascochyta* and lodging and exceeds other fodder varieties in yield.

Selection VIR–2 of *Bromus erectus*, from a wild form from the Krasnodar hills, is possessed of high tillering capacity and forms a good sward, withstands drought and responds well to improved conditions; it gives much higher yields of hay than *Arrhenatherum elatius*.

Kuban' 2 fescue is a selection from a wild form and is more tolerant of unfavourable conditions than the varieties previously grown; its hay has a protein content of 10·6–12·9%.

117 KOVERGA, A. S. & RYNDIN, N. V. **(Some results of the research at the Nikita State Botanical Garden).** Agrobiologija (Agrobiology) 1957 : No. 1 : 112–18. [Russian].

This survey of introduction and breeding work at Jalta refers to recent selections among the following plants.

**Essential oil plants.** New forms of lavender, *Salvia* and rose, all highly productive of oil, were selected.

**Stone fruits.** New selections of hardy apricots and peaches have been made.

**Fig.** Mention is made of Smena [Change], Suhofruktovyj [Dried Fruit], Aromatnyj [Aroma] and Podarok Oktjabrja [October Gift], all of which ripen early and yield high-quality dried fruit with 65–68% sugar content.

**Almond.** Productive varieties with nuts of high quality have been bred.

**Olive.** Large-fruited varieties with oil contents of 35% and upwards were selected among Soviet and introduced material. The former selections include Crimean 172 and Nikita 1, 2 and 5.

118 Om sortförsök på Ålands försöksfält. **(On varietal trials on the trial fields of Åland).** Tidskr. Lantm., Helsinki 1957 : **38** : 132–33.

Results of trials of wheat, barley, oats, forage legumes, root crops, potato and peas, held in the Åland Islands in 1956, are reported briefly.

119 Årsberättelse över Sveriges Utsädesförenings verksamhet år 1956. **(Annual report of the work of the Swedish Seed Association in the year 1956).** Sverig. Utsädesfören. Tidskr. 1957 : **67** : 70–165.

In addition to the work described below, notes are provided on lines which have done well in trials of commercial and breeding lines at Svalöf and the branch stations.

**Wheat.** The autumn wheats Eroica and Odin have been extensively used in crosses, the former for its good tillering capacity, the latter for its hardiness, straw strength and yield. At Östgöta, Ög01440 x Eroica I has shown promise and at Ultuna a series of lines from crosses of Eroica with Odin or sister varieties of Odin are doing well. Among spring wheats, Kärn II [Kernel II], Drott [King] and Pondus have been most frequently used as parents. In breeding for high protein and baking quality, which are negatively correlated with yield, the high-yielding variety Sv01290, developed from the two high-quality varieties Diamant II [Diamond II] and Kärn II, is of interest. Breeding for resistance to rusts and mildew has been initiated.

**Oats.** A number of promising breeding lines are referred to, including Å01680 which has averaged 5% higher yield than Blenda, and Å01651 (Vidar x Guldregn II [Golden Rain II]), a very early yellow oat with high yield, stiff straw and a high kernel content, outyielding Guldregn II by 6%.

**Rye.** Among the more notable new lines developed are a stiff-strawed, high-yielding line, Vrm 49/24, from a complex cross involving Kungs II [King's II], Sangaste and Toivo; the lines Å49/87 and Å53/54, both from Kungs II x Björn [Bear] and both having stronger straw than Björn together with good hardiness and yielding capacity; and K44/12 (Kungs II x Gotlandsråg [Gotland rye]), which, although not equal to Värne in yield, appears to be more drought resistant. Of the colchicine-induced tetraploid populations under investigation, two lines with short stiff straw have been found in the $C_2$ and $C_3$ generations of Kungs II. Tetraploids from crosses involving Stål [Steel], Petkus and Kungs have shown promise in trials, also a new tetraploid line of Värne. Studies of self sterility and inbreeding effects in tetraploid and diploid rye have been carried out.

**Barley.** Good straw stiffness, earliness and yield have been found in Sv06100 (Marockanskt [Moroccan] x Edda) and Sv51/141 (Maja x Asplunds), which have outyielded Asplunds by 13% and 6% respectively. Genetical work in progress includes the study of numerous induced translocations which have been cytologically located and of the expression of heterosis in autotetraploid heterozygotes of the types *AAAa*, *AAaa* and *Aaaa*. Among X-ray induced mutants, Tidig 8 [Early 8] is both earlier and stronger-strawed than the parental variety Bonus. At Kalmar, the new variety Bredbladig mutant [Broad-leaved Mutant] has outyielded Bonus in three consecutive seasons.

**Grasses.** *Lolium perenne* 'Sv01408a' (Victoria x Valinge) has done well in both first-year and older leys. Self sterility in meadow fescue is being studied and investigations on X-irradiated *Poa pratensis* are in progress.

**Lucerne.** The new breeding line 656 (Du Puits x Grimm) has outyielded Grimm by 9% in first-year plots. Crosses between $C_2$ lines and normal tetraploids have been effected with the aim of producing hexaploids. At Ultuna, different *Medicago* species and interspecific crosses are being studied with respect to their suitability for tripping and pollination by common Swedish bees and attempts are being made to develop a creeping lucerne for pastures.

**Clover.** Sv0414, a white clover selection from a New Zealand strain, and Sv0425 (Sv0414 x Kersey) are characterized by large leaves, luxuriant growth and good runner formation. Among species in which chromosome doubling has been induced, some white and red clovers are now in the $C_2$ generation. Studies of *Sclerotinia* resistance in red clover have been initiated.

**Root crops.** The work on tetraploid turnips, synthetic swedes and polyploid beets continued [cf. XXVII, 1210]. Culture of embryos on artificial media is proving of value in interspecific *Brassica* crosses.

**Potato.** The industrial variety Sv50082 (Sandnudel 98 x Elsa) exceeds Dianella in yield of tubers by 10%, equals it in starch content and is resistant to late blight and immune from wart. Other wart-immune lines are Sv51076 and Sv52106, both from Bintje x Sv39108 and both outyielding Bintje.

**Flax.** Several Svalöf lines outyielding the Netherlands variety Wiera have been developed.

**Rape.** Some winter rape and winter turnip-rape selections with unusual winter hardiness are mentioned. Several turnip-rape varieties have been subjected to doubling with the aim of synthesizing a winter-hardy rape.

**Pea.** The dried-pea varieties U03303 and U03301, both from Torsdags II [Thursday II] x Munk [Monk], have equalled Strål [Ray] and Kloster [Cloister] in yield. U03521 (Ambrosia II x 03101), which is as early as Torsdags III but higher yielding, with big seeds of good cooking quality, is being multiplied. Other promising lines include the garden pea U0410 (Gyllen x Concordia) which exceeds Concordia in earliness and yield; the fodder peas Vrm05843 (Malm x Artturi) and U05941 (Itero x 03101), both with vigorous vegetative growth; and the very early pea Å06281 (Torsdags II x Nola II).

120 SALZMANN, R.
Tätigkeitsbericht der Eidg. Landwirtschaftlichen Versuchsanstalt Zürich-Oerlikon über das Jahr 1956. **(Report on the work of the Federal Agricultural Research Station, Zürich Oerlikon, for the year 1956).**
Landw. Jb. Schweiz 1957 : 71 : 303–71.

The results of varietal trials and brief details of breeding on the following crops are presented: wheat, oats, barley, rye, maize, leguminous forage plants, potato and sugar beet.

121 **Annual Administration Report of the Department of Agriculture, Baroda, for the year 1953-54** (1955) : Pp. 331.

Selection, breeding and progeny trials have been carried out with *Pennisetum typhoideum*, *Eleusine coracana*, *Paspalum scrobiculatum*, sweet potato, chilli, *Guizotia*, castor oil plant, *Sesamum*, linseed, safflower and onion.

**Wheat.** Crosses have been made at Niphad involving introduced strains from Africa, Australia and Mexico with the object of introducing stem rust resistance. Some selections have shown promising resistance and other characters in trials in Karnatak and Gujarat. A number of pure-breeding, stem-rust resistant selections from Gaza crossed with local races are now available.

**Maize.** A number of hybrids introduced from the USA and one from Australia have all been found inferior in yield to local lines at Dohad and Arbhari while three English hybrids significantly outyielded local lines at Dohad. A three way hybrid, (I–5 x L–5) x S–23, has given higher yields than single hybrids and local lines in trials at Arbhari.

**Sorghum.** *Striga*-resistant selections from M–35–1 x YK and M–35–1 x Bonganhillo have shown resistance under field conditions in trials at Karad where they outyielded local lines. Trials of selections at a number of localities in Deccan, Karnatak and Gujarat are also reported.

**Rice.** Extensive progeny trials are reported from Deccan, Konkan, Karnatak and Gujarat. A number of blast-resistant selections have been under trial at Mahableshwar and Co–26 x K–42 and Co–26 x K–540 have maintained their resistance for a second season.

**Cotton.** Research at Surat is aimed at the development of a wilt-resistant variety with a staple length of at least one inch combined with other desirable agronomic characters. High yielding F$_2$ segregates with a ginning outturn of over 36% and long staple have been obtained from crosses between 2087 on the one hand and 2334 and Persian derivatives on the other. At Broach all progenies of 87–24 x Vijay proved resistant, promising sub-types of strain 98–24 are undergoing district trials and a sister selection, 98–41, is recommended to replace Vijay in the Narmada-Mahi zone as it is earlier, higher yielding and of superior lint quality. An improved strain developed at Amreli, CJ73, has done well in small-scale field trials.

Two Indo-American types are reported as being suitable for both rainfed and irrigated conditions in Gujarat. One of them, 134–Co2–M, is of superior quality and is especially suitable for areas with light soil. Promising long-staple selections have been made in Khandesh from crosses involving Virnar, Dokras 2–9–8–3 and Coimbatore strains of *Gossypium arboreum* and in Karnatak breeding for resistance to blackarm combined with high quality is in progress.

Wilt resistance has been shown by progeny from strain 98–24 and from the following crosses (E22 x 1802) F$_5$–92 [(E22 x 1802) F* x 66–66], [(E22 x 1802) F$_3$–98–41], (670 x Dhulia–2) and (*G. arboreum* x V49) D2.

***Hibiscus.*** All of 615 selections of *H. esculentus* tested were found to be highly susceptible to the yellow-vein mosaic virus while of the four wild species tested, *H. vitifolius*, *H. tetraphyllus*, *H. trionum* and *H. abelmoschus*, the first was completely resistant and the second showed only vein swelling. Successful crosses between wild and cultivated species were only obtained with *H. tetraphyllus*.

**Tobacco.** The new, high-yielding bidi strain, S–20 [XXVII, 4254], is being popularized in the Nipani region and crosses and back crosses of this line with Charotar varieties are under investigation.

**Groundnut.** Varieties resistant to tikka disease and root rot, *Sclerotium rolfsii* (*Pellicularia rolfsii*), have been crossed with promising local selections. Trials of erect, semierect and spreading selections of varying maturity are reported.

**Banana.** The green mutant of red banana has been found to breed true. All varieties except Bhurkel ripened satisfactorily at 66–68° F.

**Vegetable crops.** Four strains of *Sclerotium rolfsii* (*Pellicularia rolfsii*) have been isolated and their physiology and host range are under investigation. Preliminary results indicate that some strain variation exists.

**Pea.** Although the fungus causing pea wilt at Wai and Mahableshwar is indistinguishable from *Fusarium orthoceras* var. *pisi*, the causal agent of pea wilt in the USA, only one of the six resistant American varieties tested at Poona proved resistant to the Bombay strain of the fungus, which is therefore thought to be a distinct biotype.

***Cajanus cajan.*** The family designated F–52 was found at Arbhavani to be significantly superior in wilt resistance and at Annigerri 136–1 and 161–1 showed good field resistance.

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* *sic.*

122 **Annual Report of the Department of Agriculture, Government of Bombay, 1954-55** (1956) : Pp. 357.

Breeding and selection have continued with *Panicum miliaceum, Setaria italica, Pennisetum typhoideum, Eleusine coracana, Paspalum scrobiculatum,* tobacco, *Guizotia,* mustard, castor oil plant, *Sesamum,* safflower, groundnut, onion and pulses.

**Wheat.** Progeny of several generations from crosses between Gaza and rust-susceptible varieties has been tested for rust resistance at Niphad and Bailhongal and 11 out of 48 $F_6$ and $F_7$ progeny were outstanding in this respect. Further crosses have been made involving *Triticum timopheevi* and *T. durum.* Other progeny trials are also reported.

**Maize.** Top crosses were made at Dohad between Sumeri maize, as the pollen parent, and 120 inbred lines in an investigation of their combining ability. No superiority was shown by nine Australian hybrids compared with local strains but several among 39 white and 32 yellow varieties from South America and Mexico were superior in respect of their resistance to drought and *Helminthosporium turcicum* and eight white and two yellow were also superior in yield although slower to mature than the local lines.

**Sorghum.** $F_1$ to $F_7$ progeny of a cross between *S. vulgare* M–35–1 and sudan grass have been under trial at Mohol with the object of isolating improved smut-resistant forage strains. Bail 4–1–4 and 25–1–2 were found to be highly resistant to *Striga* under field conditions at Bailhongal and trials of other selected progeny have been carried out at a number of centres.

**Rice.** Promising early, high-yielding $F_3$ selections of good quality from *japonica* rice x EK 70 have been isolated for further study at Karjat and blast-resistant selections are under trial at Karjat, Kumta and Mugad. $F_4$ selections from crosses between Co.25 and Co.26 on the one hand and K–42, K–540, K–184 and 1–B–12–11 on the other have maintained their resistance for three years and resistant selections have been isolated from other varieties. Ratnachandi, Neeradaddi and D–10 selections showed greater resistance to *Pachydiplosis oryzae* than Jaddu at Kumta.

**Cotton.** Selection and testing of strains with wilt resistance, blackarm resistance or improved quality have continued [cf. 121] and strain 98–41 has been released as Digvijay [XXVII, 4187]. At Broach 16 progeny from 98–41, 15 from 98–24 and five from (E 22 x 1802) F6–92 proved resistant to wilt while at Surat 16 selections from 2087 and others from Dhulia-2 were resistant. In trials at Dharwar of 114 selections, four were highly resistant to blackarm and four other selections and 10 crosses were promising in this respect.

**Hibiscus.** Only 12 lines from 82 back crosses were found to produce viable seeds but 13 plants from four of these lines showed complete resistance to the yellow-vein mosaic virus.

**Sugar cane.** Both Co.421 and Co.443 showed greater resistance than Co.419 to top-shoot and stem borers. Only Co.475 proved susceptible to rust in tests at Poona.

**Linseed.** In a comparison between six rust-resistant NP selections and local strains at Bijapur, the NP strains were outyielded by the others and also suffered seriously from powdery mildew.

**Mango.** Complete deblossoming of the variety Alphonso during a year when it would normally have flowered has been found to result in the production of a large number of flowering shoots in the following year, when it would not normally have flowered. Similar treatment of Pairi, which is also a biennial-bearing variety, had no effect.

**Tomato.** Crosses and reciprocal crosses between *Lycopersicon esculentum* on the one hand and *L. peruvianum* and *L. glandulosum* on the other have been made with a view to developing virus-resistant lines.

**Proceedings of the Fourth Scientific Workers' Conference held in the Agricultural College and Research Institute, Coimbatore on 20th August 1954** (1956) : Pp. 164.

123 *Kalyanaraman, S. M. & Ramachandran, K. Heterosis and its utilization with reference to some cotton hybrids. (pp. 3–15).*

Crosses have been made at the Cotton Breeding Station, Coimbatore, among annual and perennial varieties of both *Gossypium hirsutum* and *G. barbadense* and tabulated data are provided on the performance and characteristics of the $F_1$ progeny. In the case of the annual strains *G. hirsutum* 'Co.2' x *G. barbadense* 'SIV135' the $F_1$ progeny showed significant heterosis for plant height, flower and boll production, yield of kapas and seed index but in the case of crosses between perennial strains heterosis was shown for only a few characters in each case by interspecific crosses and was not shown by intraspecific crosses. The most promising results in this group of crosses were given by *G. hirsutum* 'Moco' x *G. barbadense* 'Quebradinho.'

124 *Kalyanaraman, S. M. & Santhanam, V. The role of wild species of* Gossypium *in the improvement of cultivated cottons. (pp. 19–30).*

A list is given of 39 interspecific crosses, involving 14 species of *Gossypium*, made at the Cotton Breeding Station, Coimbatore, between 1937 and 1945, together with notes on the fertility and yield of the hybrids. Since 1945 breeding and selection has been continued with hybrid derivatives of *G. raimondii*, *G. darwinii* and *G. taitense*. Lines possessing jassid resistance have been obtained from crosses between this material and *G. hirsutum* and others with blackarm resistance from crosses involving *G. hirsutum* x *G. barbadense*. An appendix provides information on improvements in fibre quality so far achieved in Madras selections of *G. hirsutum* and *G. arboreum*.

125 *Rao, U. N. Crop improvements and classification in brinjal* (Solanum melongena *Linn*). *(pp. 83–93).*

Possible classifications of varieties of *S. melongena* are discussed and three alternative groupings, based on fruit shape, days to maturity and fruit colour, are suggested for 32 varieties examined at Coimbatore.

126 *Veeraswamy, R. & Venkataraman, K. Introduction of a new variety of cholam (Periamanjal cholam) in the north Arcot district. (pp. 150–54).*

The performance of the above sorghum variety in trials in the Talaivirichan region of Madras indicate that it is well adapted to this region and gives good yields of grain and forage.

127 *Raman, V. S. Polyploidy in cereals. (pp. 155–63).*

Studies of naturally occurring and induced polyploids in species of *Oryza, Sorghum, Pennisetum, Eleusine, Setaria, Paspalum, Panicum* and *Echinochloa* are reviewed.

128 ALLAN, W.
**Annual Report of the Department of Agriculture, Cyprus, for the year 1956** (1957) : Pp. 57. (Mimeographed).

In addition to the breeding work described below, this report mentions variety trials of wheat, oats, barley, forage grasses and legumes, cotton, safflower, citrus fruits, stone fruits, pistachio, groundnut, olive, strawberry, grape, tomato, and broad bean and carob.

**Cereals.** Further selections were made from lines derived from crosses between local and introduced varieties of wheat and barley; some of the barley selections gave better yields than the parents. Races 14 and 24 of *Puccinia graminis* var. *tritici* were isolated from wheat samples from many districts; race 14 was most prevalent.

129 **Annual Report of the East African Agriculture and Forestry Research Organisation for the period 1st July, 1955 to 30th June, 1956.** Pp. 114.

**Maize.** The study of the Brieger method for maize improvement has been continued. Many top-cross lines, most of which originated from Nyanza and Katumbili, are now ready for yield trials. Some families of Nyanza maize have shown marked differences in drought resistance in the $S_3$ generation; these are to be top crossed. The testing of lines resistant to streak is being continued. $F_1$ hybrids of Katumbili x Peruvian are doing well.

Resistance to the field race of *Puccinia polysora* (EA1) has been incorporated into locally adapted maizes including Katumbili; resistant pure lines are to be further tested. Some lines derived from AFRO29 (Colombia 2) were found to carry a gene that conferred almost complete resistance to EA1. Other lines derived from AFRO 24, 27 and 29 were found with one or more genes conferring high resistance to EA1 and to EA2, which appears in glasshouses [cf. XXVI, 405 and 2075].

**Cassava.** Intercrosses of third back-cross derivatives from ceara and Dichotoma and from ceara x cassava hybrids were included in 24 clones selected for high resistance to mosaic and brown-streak viruses.

Crosses with *Manihot cathartica* were unsuccessful.

130 VALDEYRON, G.
Rapport sur les travaux de recherches effectués en 1955 du Service Botanique et Agronomique de Tunisie. II. Amélioration des plantes. **(Report of the research work carried out in 1955 by the Botanical and Agronomic Service of Tunisia. II. Plant breeding).**
Ann. Serv. bot. agron. Tunis. 1954 : **27** : Suppl. : Pp. 35.

In addition to the breeding work reported below brief reports are given of varietal trials of tomato, pimento, pear, cabbage, cauliflower, lettuce, aubergine, olive, grapes and forage crops.

**Cereals.** Many lines and varieties were tested for yield, quality and resistance to disease. The hard wheat Hourani x Bidi 984 gave a promising yield but tended to lodge. Mahmoudi x M'Rari D117 line 118 was outstanding in yield and quality. Crosses have been made using the high-yielding soft wheats Étoile de Choisy [Star of Choisy] and San Giorgio.

**Flax.** The American variety 63–B 5128 was apparently more rust resistant and more productive than local varieties.

**Tomato.** Hybridization was continued with Cantella, Early Chatham, Victor and Marmande.

**Fruit.** Many introductions, mostly from the Middle East, are being tested. The apricot hybrid Caninos x Amor Leuch is being tested. The cross Caninos x Hamidi was not successful.

### 131 Annual Report of the Department of Agriculture, Ghana for the year 1954-55 (1957) : Pp. 53.

In addition to the breeding reported below, varietal trials were carried out with maize, rice, sorghum, tobacco, cacao, groundnut, pineapple, onion, cabbage, cauliflower, lettuce, tomato and bean.

**Maize.** A back-crossing programme using American varieties as a source of weevil resistance has begun. The West African Maize Rust Research Unit has continued to test introductions from Central America and the Caribbean and crosses between Italian inbreds. Corn-borer resistance lines from Minnesota and *Helminthosporium*-resistant lines from Florida are being multiplied prior to testing. Resistance to *Puccinia polysora* is being incorporated into white varieties.

West African maize types are being surveyed to determine their genetic variability and the selection which has taken place.

**Rice.** Crosses were made with the object of improving the straw strength of high-yielding varieties and reducing the maturity period of some North Borneo varieties.

**Groundnut.** Varietal differences in susceptibility to *Cercospora* were marked; the long-maturing varieties were found least susceptible. Kinorates, a local variety, and F18, a South African variety, yielded significanty more than F21 and F20. At Vipeve, Cameroons outyielded the local varieties tested.

Some rosette-resistant varieties were imported for testing.

### 132 Annual Report on the Department of Agriculture of the Northern Region of Nigeria, 1953-54 : Pp. 101.

Varietal trials with the following crops are reported: maize, *Pennisetum typhoideum*, sorghum, cotton, sugar cane, cassava, tobacco, sesame, groundnut and soya bean.

***Pennisetum.*** Crosses were made between selections from a number of early-maturing varieties.

**Sorghum.** Ordinary mass selection was compared with various modifications of mass selection to determine a satisfactory method of improving a variety. Methods are recommended for uniform and more variable varieties.

Attempts are being made to cause a rearrangement of chromosomes by means of colchicine treatment.

**Cotton.** Reselection and testing were continued with derivatives of Samura 26C. Of these, 479–25 was particularly promising in yield and quality.

**Sugar cane.** Testing for resistance to *Colletotrichum falcatum* has begun.

**Groundnuts.** Hybridization is being continued with high-yielding local varieties, including the local spreading type Mwitunde. An introduction from Tanganyika has shown resistance to the rosette virus.

**Soya bean.** Colchicine treatment of seedlings of five varieties has been given.

### 133 Annual Report of the Department of Agriculture, Uganda Protectorate, for the year ended 31st December, 1956 : Pp. 62.

**Maize.** Six lines of Muratha were found to be homozygous for resistance to *Puccinia polysora*. These lines are to form the basis of a rust-resistant synthetic variety. Transference of resistance to the local maize type, K8, has continued.

Yellow maize from Kongai, Kenya, did well in the varietal trials.

***Eleusine.*** Wildheads (Ekitu) was found to be a mixture of *Eleusine indica* and a new species, which is to be named *Eleusine africana*; the chromosome numbers of these two species are being determined.

**Sorghum.** At Serere, good yielding varieties, which mature in 90 days or less, are now available; these are mostly dwarf. The breeding of varieties suitable for combine harvesting is continuing; these varieties do not yield as well as some indigenous types unless they are planted closely together.

**Cotton.** At Namulonge, improved strains of BP52 have been made available; these produce 20% more lint per acre than BP52 and are superior in spinning quality. The strain NC54 is to replace BP52 and will be followed by other superior strains of the same series. New strains of S 47, designated DE 715/6 and DE 715/6M are being multiplied; these have a lesser tendency to seed coat nep than commercial S 57.

**Sugar cane.** Five varieties were given heat treatment against ratoon stunting disease; the yields from treated and control crop are compared. Eighteen East African varieties were given hot-water treatment and multiplied in isolation at Kawanda.

**Coffee.** Attempts are being made to breed a high-yielding Arabica type, which will be sufficiently hardy to survive the poor standard of cultivation. Crosses were made between Kawanda types which retain their canopy and other types with high quality and yield. Rome Sudan and an Abyssinian selection were found resistant to *Hemileia vastatrix* at Kawanda; crosses were made to incorporate this resistance into standard types. Kenya selections were crossed with the Maragogipe type which has large beans; some high yielding progeny was selfed.

Selection and classification of Robusta coffee with respect to yield and quality have continued at Kawanda. The breeding system of *Coffea canephora* is being investigated.

Observations on a number of other members of the tribe Ixoreae, mainly species of *Ixora*, have shown them to be almost completely self incompatible.

**Banana.** Varietal trials of resistance to *Fusarium oxysporum* f. *cubense* are being continued at Kawanda. Abnormal classification and a field botanical key of Uganda varieties are being prepared.

**Proceedings of the Second Annual Meeting of the Canadian Society of Agronomy, University of Toronto, June 25-28, 1956.** Pp. H–18 + B–9 + C–50. (Mimeographed).

134 *Mittelholzer, A. S. An evaluation of certain agronomic characteristics of tetraploid Dollard red clover. (pp. A–9–A–11).*

The agronomic characters of the tetraploid were compared with those of the diploid, when both were grown under field conditions. The tetraploids were found to be more sturdy and to have larger and thicker leaves than the diploids. Some tetraploid lines yielded as much forage as the best diploid lines. Tetraploid seed yield was low, but different lines varied in this respect.

135 *Bubar, J. S. Flower colour inheritance studies in Broadleaf birdsfoot trefoil* (Lotus corniculatus L.). *(pp. A–12–A–14).*

The inheritance of flower and keel tip colour was studied. The author suggests that the following hypothesis explains the segregation data. Tetrasomic inheritance is involved, with red dominant to yellow, for both flower and keel-tip colour. The red keel-tip phenotype is produced by two or more dominant red alleles. Segregation data for progeny obtained by selfing or from crossing closely related parents did not appear to fit this hypothesis. It is suggested that this may be explained by the keel-tip locus being linked to an incompatibility locus.

136 *Zillinsky, F. J. New developments in oat hybridization of importance to plant breeders. (pp. B–8–9).*

Attempts were made to produce types which were both compatible with hexaploid types and possessed the desirable characters of diploid species. Autotetraploids were produced which were compatible with *Avena sativa* when the autotetraploid was used as the female parent. Diploid and tetraploid species were crossed and the hybrids were selfed for several generations until fertile tetraploids were obtained. Highly fertile tetraploids resistant to stem and crown rust were obtained from *A. strigosa.* Fertile tetraploids were also obtained by crossing autotetraploids and tetraploid species and selfing the hybrids for several generations. All these tetraploids were compatible with hexaploid species. Synthetic hexaploids, obtained by crossing tetraploid and diploid species and then doubling the chromosome number of the hybrid, were difficult to cross with normal hexaploids. Varieties appeared to differ in the fertility of their hybrids. An autotetraploid *A. strigosa* from Japan crossed with *A. sativa* gave hexaploids, which were almost completely fertile after five generations. The self fertility of synthetic hexaploids arising from the cross *A. abyssinica* 'CD 4550' x *A. strigosa* 'CI4748' was greater than that of the cross *A. abyssinica* 'CD4550' x *A. strigosa* 'CD3820'.

**Abstracts of the Annual Meeting of the Canadian Society of Agronomy held at the Agricultural Institute of Canada, University of British Columbia, Vancouver, B.C., June 24-June 27.**

Agric. Inst. Rev. 1957 : **12** : No. 3 : 30–37.

137 *Baenziger, H. & Greenshields, J. E. R. The effect of interspecific hybridization on certain genetic ratios in sweet clover. (p. 32)*

Genetical studies on sweet clover carried out at Saskatoon, Sask., indicate simple Mendelian inheritance for coumarin content, seed permeability and growth type, low coumarin, permeable seed coat and the α type of growth each being determined by a single recessive gene. Normal 3 : 1 ratios in respect of these were observed in some $F_2$ populations but others showed significant deviations from this ratio, apparently associated with the effect of interspecific hybridization. All the coumarin-deficient strains are from *Melilotus alba* x *M. dentata* progeny and evidence is presented to show that the deficiency always occurs in the class containing the gene from the nonrecurrent parent. An inherent unbalance appears to cause a smaller proportion of gametes carrying genes from the nonrecurrent species to fail to complete the reproductive cycle.

138 *Zillinsky, F. J.* Avena strigosa *as a source of new oat breeding material.* (*p. 32*).

The advantages and practical difficulties of using *A. strigosa* in an oat breeding programme are discussed.

139 *Wells, S. A. Inheritance of reaction to covered smut of barley* (Ustilago hordei). (*p. 32*).

The results of inoculation of $F_1$, $F_2$ and $F_3$ progeny of diallel crosses between five susceptible and one resistant barley variety with race 6 of *U. hordei* indicate that four genes for resistance are involved. Titan, OAC 21, Ogalitsu and Anoidium carry either the same gene or different, closely linked dominant genes for resistance. Anoidium carries a second dominant gene for resistance, designated *UH* 2, Ogalitsu an additional recessive, *UH* 3 and Jet a single recessive *UH* 4. No association was found between reaction to *U. hordei* and number of kernel rows, lemma teeth, lemma and pericarp colour, hull adherence, aleurone colour, awn barbing, length of rachilla hairs or rachis pubescence.

140 **Annual Report of the Department of Agriculture, Jamaica for the year ended 31st December, 1955** (1956) : Pp. 74.

Varietal trials are being carried out with maize, rice, guinea grass, coconut and banana. Inbreeding has started with JSY maize. Classification studies of manihot are in progress.

141 **Annual Report of the Department of Agriculture, Trinidad and Tobago 1955** : Pp. 73.

**Rice.** The results of extensive variety trials are discussed.

**Cacao.** Recording of yield and witches' broom resistance was continued on introduced lines from South America, local selections and the progeny of crosses between high-yielding selections and immune lines.

**Coconut.** An isolated nursery has been planted with selected seed from high-yielding and otherwise desirable local trees and imported seed from Ceylon.

**Carnegie Institution of Washington. Year Book No. 55 : 1955-1956** : Pp. 343.

142 *Clausen, J., Hiesey, W. M. & Nobs, M. A. Studies in Poa.* (*pp. 236–38*).

Data from replicated test plots at eight widely separated localities in the USA indicate that many of the new hybrid lines have a greater range of tolerance of widely differing climates than was anticipated. Derivatives from *P. ampla* x *P. alpigena, P. ampla* x *P. pratensis* and *P. scabrella* x *P. pratensis* were on the whole successfully established at most of the centres but *P. scabrella* x *P. ampla* and some lines from *P. scabrella* x *P. pratensis* have not survived the severe winter conditions of the eastern and midwestern states. Differences between lines of the same parentage are sufficiently marked to be of considerable importance in agronomic selection. A strain of *P. pratensis* originally from Newport, Ore., has performed well as a turf grass at Purdue University, Ill., and at the Pennsylvania State University and has also shown a wide climatic tolerance in trials on the west coast of the USA and in Europe [cf. XXVII, 134].

Stabilized apomictic lines have now been established of *P. ampla* x *P. arida*. Of 77 $F_1$ progenies, 49 segregate freely and are sexual, 18 are less than 30% apomictic, 10 are sufficiently apomictic to warrant further testing and of these seven are more than 50% apomictic and three show particular promise. One of these three is less than 50% apomictic and is outstanding in vigour and range of tolerance while the other two are 70% apomictic. A large variety of vigorous recombination types occur in segregating $F_2$ progenies of this cross.

A comparison under uniform environmental conditions has been initiated of 15 apomictic hybrids derived from a single sexual $F_1$ hybrid of *P. ampla* x *P. pratensis* but selected at widely different places. A wide diversity in responses has been observed during the first year.

143 *Hershey, A. D., Burgi, E., Mandell, J. D. & Melechen, N. E. Growth and inheritance in bacteriophage.* (*pp. 297–301*).

It is suggested that the inefficiency of transfer of DNA from parental to offspring phage may be accounted for by the three following facts:

(1) some parental particles, amounting to 10 or 15% of the total, fail to inject their DNA into the bacterium to which they attach themselves, (2) up to 5% of the particles inject into the culture medium and not into bacterial cells and (3) some infected cells lyse spontaneously about 25 minutes after infection. In the latter case DNA is released in two forms, either in offspring phage particles or in the free state, and a method for detecting these two forms separately is described. It is concluded that the bulk of the parental DNA is a potential precursor of offspring DNA and that little or no transfer occurs by way of intermediates smaller than polynucleotides. Evidence from studies of the fate of $P^{32}$-labelled and ultraviolet-irradiated phage particles is presented in support of the suggestion that viral DNA is differentiated on the basis of function into a photosensitive chromosomal part and a photoresistant nonchromosomal part. Evidence is also presented, from infection experiments using $P^{32}$ *h* and $P^{31}$ $h^{+}$ phage, that an appreciable amount of parental DNA remains associated with the parental genotype during transfer and passes in functionally intact form from parental to offspring phage.

144 *Demerec, M.* et al. *Bacterial genetics.* (*pp. 301–15*).

Much of the work reported here has already been summarized [XXVII, p. 594]. Further analysis of mutant strains of *Salmonella typhimurium* has been carried out and it has now been confirmed that at least five unlinked gene loci, *meA*, *meB*, *meC*, *meD* and *meE*, are involved in the 48 known methionine mutants. A fifth group of mutants, *cysE*, has been identified among the 44 cystine mutants and evidence so far obtained indicates that the genes involved are not closely linked except in the case of *cysC* and *cysD*. Only *cysB* mutants showed any linkage with the *try* group of markers. The histidine region of the *Salmonella* chromosome is thought to be divided into seven loci, arranged according to their position in the biosynthetic sequence. Examples are given of multiple-site mutants, as in the case of the *cysD* and *cysC* loci, where six of the 14 known mutants of these two loci are multiple-site mutants. The known properties of such mutants are summarized as follows: "multiple-site mutants fail to produce recombinants in transduction tests with a number of closely linked markers; the frequency with which they are found at any one locus is, as a rule, lower than the frequency of occurrence of single-site mutants; they involve a well-defined region of chromosome; they do not revert to prototrophy; and, in the one case (*hiB*–22) in which it is possible to study crossing over with adjacent markers, a multiple-site mutant exhibits a lower frequency of crossing over than do single-site mutants of the same locus." The possible mechanism by which such mutants may originate is discussed.

An exact theory of continuously growing populations of bacteria has been developed from evidence obtained from studies of bacterial populations in the chemostat. A system of equations has been set up, formulating rates of change of cell densities, rate of change of concentration of controlling growth factor in the culture tube and change of growth rate constants as a function of limiting-nutrient concentration.

145 *Kaufmann, B. P.* et al. *Organization of cellular materials.* (*pp. 315–22*).

Electron microscope studies of the chromosomes of *Tradescantia* during prophase have shown that they consist of "a hierarchy of pairs of pairs of helically disposed chromonemata". Each set of pairs constitutes a rim, about 40 Å. wide, of densely electron-scattering material surrounding a less dense cylindrical core. Comparison of the dimensions of the finest discernible strands with those of the entire chromosome suggest that the somatic prophase chromosome of *Tradescantia* is made up of at least 64 and possibly 128 subsidiary units.

146 *McClintock, B.* *Mutation in maize.* (*pp. 323–33*).

Mutations at the bronze locus have been shown to be related to the removal of *Ac* from the locus or to other events induced by *Ac*, mutation to a stable *bz* expression being four and a half times more frequent than mutation to *Bz* in plants homozygous or heterozygous for *bz*. In 11 out of 14 cases of mutation to a stable *Bz* allele it could be shown that the mutation-producing event was associated with removal of *Ac* from the bronze locus; in five cases it was transposed to a different locus and in six it disappeared altogether. In other plants, where *Bz* was unstable, *Ac* was present close to *Bz* and was shown to be responsible for mutations at *Bz*. An unusual mutant resulting in a marked reduction in anthocyanin pigmentation was found to be associated with the removal of *Ac* from the *Bz* locus and is thought to represent a change from the direct control of mutation by *Ac* to the *Ds–Ac* type of control [cf. XXVII, 139]. Other examples of mutation at the *Bz* locus controlled by removal or transposition of *Ac* are discussed. Further evidence is given of changes in gene expression produced by *Ds* when inserted distal to *Sh* in the presence of *Ac* but without the removal or transposition of *Ds*. Continued study of the $a_1^{m-1}$–*Spm* system of control of gene action indicates that a number of different elements are present in the nucleus, each affecting the action of $a_1^{m-1}$. An investigation has been initiated into changes in chromosome organization and gene expression produced by a structural modification of chromosome IX, where the chromosome is broken into two parts, a fragment chromosome consisting of the distal third of the short arm and a deficient chromosome composed of the proximal two thirds of the short arm and the whole of the long arm. Synapsis in heterozygotes of the deficient chromosome with the homologous parts of the normal chromosome throughout the whole of the long arm and usually throughout most of the short arm was observed but synapsis of the fragment chromosome did not always occur. The deficient chromosome was transmitted through the pollen grain only when the fragment chromosome was also present in the tube nucleus but it could be transmitted through the female gametophyte without the accompanying fragment. Examples are given of crosses involving lines with and without such fragments. Some of the results obtained indicate that crossing over with the fragment occurred and that the fragment is responsible for initiating modifications in gene expression in the *Sh* and *Bz* region of chromosome IX.

147 **Report and abstracts of the 1957 annual meeting of the southern division of the American Phytopathological Society.**
Phytopathology 1957 : **47** : 312–14.

Articles of interest to plant breeders at this meeting are summarized from another source [cf. 153–73].

**Proceedings of the Meetings sponsored jointly by the American Society of Plant Physiologists and the Physiological Section, Botanical Society of America, Stanford University, Stanford, California, August 25-29, 1957.**
Plant Physiol. 1957 : **32** : Suppl. : Pp. lix. (Absts.).

148 *Moh, C. C. & Withrow, R. B. Interaction of red and far-red radiant energy in modifying X-ray-induced chromatid aberrations in broad bean.* (*p. xi*).

Bean radicles receiving far-red treatment showed 20 to 40% more chromatid breaks and exchanges after X irradiation than controls treated with X rays only while those treated with far-red followed by red radiant energy showed no appreciable increase in aberrations. An increase in aberration frequency of about 20% occurred in radicles treated with red radiant energy followed by far-red treatment but no increase was found when the radicles were exposed to both types of energy simultaneously.

149 *Lyles, W. E., Futrell, M. C. & Atkins, I. M. The effect of plant growth regulators on the response of wheat varieties to leaf rust.* (*p. xliii*).

Willet and Seabreeze wheats were treated with maleic hydrazide and Concho with 2,4-D at the Texas Agricultural and Mechanical College. Under severe natural infection by *Puccinia rubigo-vera* var. *tritici* a highly significant increase in the number of pustules was observed in treated Concho plants and a significant increase in treated Seabreeze plants. In the case of treated Willet plants the number of pustules was not significantly increased but the pustules were larger.

150 *Hageman, R. H. & Flesher, D. A comparison of triosephosphate dehydrogenase and aldolase activity in germinating corn seedlings.* (*pp. xlvi–xlvii*).

In an attempt to discover a physiological basis for hybrid vigour in maize it has been shown that the hybrid between WF9 and M14 showed a higher triosephosphate dehydrogenase activity than either parent and that the hybrid possesses more enzyme although it shows a tendency to have a lower substrate binding constant.

151 *Highkin, H. R. Temperature-induced variability in the growth and development of pea plants.* (*pp. xlix–l*).

The $F_1$ progeny of reciprocal crosses between two pea varieties subjected to constant temperatures during growth can be separated into distinct groups according to the temperature at which the pollen was formed.

152 *Highkin, H. R. The relationship between temperature resistance and purine and pyrimidine composition in peas.* (*p.* 1).

The amount of adenine in a heat susceptible pea variety was found to be the same at 14° C. and at 26° C., while in a heat resistant variety the adenine content at 26° C. was at least 100% greater than that at 14° C.

**Proceedings, abstracts of papers and addresses of the 54th Annual Convention of the Association of Southern Agricultural Workers held in Birmingham, Alabama, February 4-6 1957 : Pp. 270.**

153 *Donnelly, E. D. & Hawkins, G. E. The effects of stem type on some feeding qualities of sericea lespedeza,* L. cuneata, *as indicated in a digestion trial with rabbits. (pp. 59–60).*

A number of fine-stemmed strains of sericea were developed. These were compared with coarse-stemmed strains in rabbit feeding trials. The fine-stemmed strains were found to contain more digestible nutrients than the coarse-stemmed and more of the former were eaten.

154 *Crowder, L. V. & Craigmiles, J. P. Studies on white clover types on various grasses. (pp. 60–61).*

The Ladino types Italian and California and the Louisiana types Ala Lu and La. Syn. 1 were grown alone, or with fescue, Coastal Bermuda and Dallis grass. Four-year results indicated that the Ladino clover gives a higher yield than the Louisiana, under all these conditions.

155 *Lebedeff, G. A. Further studies on the inheritance of loose pericarp in corn. (pp. 77–78).*

The $F_1$ and $F_2$ generations from the cross between GE54 and Mpl have confirmed that loose pericarp is inherited as a quantitative character. In some double crosses using inbred lines it was found that roughness of the ears is caused primarily by looseness of the pericarp.

156 *Fleming, A. A. & Kozelnicky, G. M. Sibbing versus selfing in the maintenance of inbred lines of corn. (p. 78).*

Eighteen inbreds were investigated and 11 $S_2$–$S_8$ inbreds gave higher yields for the sibs than for the selfs. One inbred, which had been selfed for 15 or more generations, showed a significant difference with respect to yield in favour of sibbing.

157 *Self, F. W. & Finley, L. The comparative fiber strength of the Stardel variety of cotton. (p. 78).*

The Stardel variety was approximately ten per cent superior in fibre strength than three other varieties.

158 *Merwine, N. C. A cytological study of a* Sorghum vulgare *x* S. halepense *hybrid. (pp. 78–79).*

In crosses between *S. vulgare*, $2n = 20$, and *S. halepense*, $2n = 40$, the $F_1$ and $F_6$ selections were found to have $2n = 40$. Some laggards were found in anaphase I and II of the $F_1$ and $F_6$. Bivalents and quadrivalents were usually found in the hybrid, some quadrivalents occurred in *S. vulgare* and octovalents in *S. halepense*. It was concluded that *S. vulgare* is a tetraploid of two five-chromosome species and *S. halepense* is an octoploid of two varieties of *S. vulgare* or of *S. vulgare* and a similar species.

159 *Coleman, O. H. Natural crossing in sorgo. (pp. 79–80).*

In field trials with Tracy and MN2974, the number of natural crosses fell off rapidly as the distance between the plants increased, falling from 29·6% at the 3·5 foot distance to 2·2% at 35 feet.

160 *Brightwell, W. T. & Woodard, O. Strawberry variety trials in south Georgia. (p. 180).*

The yields of 12 varieties of strawberry, on fumigated, untreated soil and under different mulches, were compared. In 1956, Dixieland gave the highest average yield for all treatments and Pocahontas did very well.

161 *Hoover, M. W. The effect of maturity and storage upon the mechanical shell-out of southern peas. (p. 182).*

Storage at 70 and 100° F was found more effective for increasing the percentage of seed shelled in California 5 than in Conch and Alabama Crowder.

162 *Hoover, M. W. & Nettles, V. F. Influence of variety and storage on the quality of frozen sweet potatoes. (p. 182).*

Georgia Red, Goldrush, Porto Rico and Heartogold gave frozen products of high quality.

163 *Kushman, L. J. & Deonier, M. T. Effects of storage temperatures on Porto Rico, Allgold and Goldrush sweetpotatoes. (p. 183).*

Porto Rico and Goldrush roots were found to produce more plants than Allgold roots after storage at 60 or 70°.

164 *Kattan, A. A., Moore, J. N. & Fleming, J. W. Colour and enzymatic discoloration in sweet potato varieties. (p. 187).*

It was found that most varieties with high carotenoid content showed less discoloration than varieties with low content.

165 *Paterson, D. R. & Blackhurst, H. T. Some effects of fertilizer, variety and irrigation on the yield of southern peas. (p. 189).*

It was found that three inches of water increased the pod yield for Cream 8, Extra Early Blackeye and Purple Hull 5 by 121%, 82% and 38% respectively. Purple Hull 5 showed most response to the addition of sulphur.

166 *Moore, J. N. & Kattan, A. A. Effect of irrigation, spacing, and fertilizer levels on the yield and quality of tomatoes.* (*p. 195*).

These investigations have shown that Moreton Hybrid gives a higher total yield than Indark, under various conditions. The Indark fruit is deeper in colour, contains more soluble solids and has a higher pH.

167 *Nelson, R. R. The genetics of compatibility in* Cochliobolus heterostrophus. (*pp. 217–18*).

Data from crosses and back crosses of monoconidial isolates of *C. heterostrophus*, the causal agent of southern leaf blight of maize, indicate that compatibility is governed by a single major gene.

168 *Hare, W. W. Inheritance of resistance to* Fusarium *wilt in cowpeas.* (*p. 219*).

The variety Iron, resistant to races 1, 2 and 3 of *Fusarium oxysporum* f. *tracheiphilum*, was crossed with Extra Early Blackeye, Purple Hull Bunch, and Mississippi Crowder, all resistant to race 1 and susceptible to or tolerant of races 2 and 3. The $F_1$ for each cross was found resistant to races 2 and 3 and the $F_2$ segregated 15 resistant to 1 susceptible. It is suggested that two dominant major genes control resistance to races 2 and 3. Other investigations indicated that in Iron resistance to race 1 is controlled by a dominant gene.

169 *Hare, W. W. Inheritance of* Cercospora *resistance in pepper.* (*p. 219*).

Line 46101 from Para, Brazil, was found highly resistant in greenhouse and field trials. Trueheart Pimiento was crossed with 46101 and the $F_1$ backcrossed to Trueheart and Early California Wonder. The $F_1$ was almost as resistant as 46101. Trials with the $F_2$ indicated that resistance is governed by several genes.

170 *Drolsom, P. N., Moore, E. I. & Clayton, E. E. Resistance to* 2 Meloidogyne *species in breeding lines of flue-cured tobacco.* (*pp. 219–20*).

Highly resistant breeding lines derived from crosses between TI706 and flue-cured tobacco varieties were hybridized with a synthetic allotetraploid, *Nicotiana sylvestris-tomentosiformis*. The progeny were highly resistant and gave satisfactory yields. Greenhouse studies indicate that the hybrids are highly resistant to *M. incognita* and *M. incognita acrita* but susceptible to *M. arenaria*.

171 *Moore, E. L. & Drolsom, P. N. Segregation for flavor in disease resistant lines of flue-cured tobacco.* (*p. 220*).

Lines from the cross Dixie Bright 102 x Hicks were found to have an objectionable flavour. The following crosses were made with lines resistant to *Pseudomonas solanacearum* and *Phytophthora parasitica* var. *nicotianae*: (1) normal (4009) x abnormal (3006–5); (2) normal (4009) x normal (Coker 139); and (3) normal with poor taste (4003) x normal (Coker 139). Progeny from the first cross segregated 19 : 1 in favour of abnormal flavour. In the second cross nine had fair and one good flavour and in the third, it was 3 : 9 : 3 for poor, fair and good flavour.

172 *Harris, H. C. & Gilman, R. L. Effect of boron on yield and quality of peanuts.* (*p. 227*).

The yield of Early Runner was found to increase more than that of Dixie Runner after boron treatment.

173 *Ergle, D. R. Some responses of normal and mutant cottons to gibberellic acid.* (*pp. 227–28*).

Empire WR, Ga. and the mutants dwarf lintless 563, dwarf red leaf 410 and round leaf 536 were tested. Only round leaf 536 produced and retained more bolls after treatment. The mutants became as tall or taller than the treated normals.

174 **67th and 68th Annual Reports of the South Carolina Agricultural Experiment Station, 1955** : Pp. 52; **and 1956** : Pp. 56.

Varietal trials have been carried out with sweet potato, cabbage, lettuce, broccoli, cantaloupe, musk melon, water melon, tomato, snap bean, lima bean, cowpea and sweet corn.

***Capsicum.*** A high-yielding, disease-resistant variety has been released as Carolina Hot. It is easily picked, of uniform quality and deciduous. It was bred from desirable plants growing in Florence, SC.

**Sesamum.** A nonshattering variety, Palmetto, has been released [cf. XXV, 3334 and XXVI, 601].

**Grape.** It has been found possible to store grape pollen in a desiccator over moistened potassium carbonate at 10° C. for three weeks, thus making possible the crossing of varieties whose flowering periods do not overlap. In a breeding programme designed to develop improved table varieties, 34 seedlings have been selected for further trial before release.

**Cucumber.** The release of Stone and Ashley during 1953–4 is reported. [Cf. XXVI, 3102].

175 **Annual report of the University of Florida Agricultural Experiment Stations for the fiscal year ending June 30, 1956** : Pp. 351.

In addition to the breeding work reported below brief reports are given of varietal trials of wheat, oats, rye, maize, barley, sorghum, rice, forage grasses, forage legumes, potato, sweet potato, cotton, ramie, kenaf, sugar cane, tobacco, castor oil plant, groundnut, peach, carrot, onion, cabbage, cauliflower, spinach, lettuce, celery, cantaloupe, cucumber, tomato, bean, soya bean, pea and sweet corn.

**Wheat.** The lines CI13250 and CI13232 were found highly resistant to *Erysiphe graminis* var. *tritici* in several districts. PI185833 was resistant at Gainsville but susceptible at Quincy. A bearded selection from PI190351 appeared resistant to leaf rust and *Septoria*, and moderately resistant to mildew.

**Oats.** Mutants obtained from progeny of irradiated Southland were found resistant to *Puccinia coronata* var. *avenae* and showed normal chromosome associations in root-tip smears. Most of these mutants showed some degree of sterility. A self-pollinated oat crop is being used to determine whether beneficial micro-mutations for grain yield may be induced by irradiation and accumulated.

The Victorgrain 48–93 lines and some derivatives of these were found highly resistant to *Erysiphe graminis* var. *avenae*. Studies of mutants resistant to *Helminthosporium victoriae* were continued. A line was found which combined resistance to *H. victoriae* with resistance to *P. coronata* var. *avenae*. $X_3$ families of Floriland showed much variation in agronomic characters and rust resistance. Resistance to race 7A of stem rust was dominant.

**Rye.** Rye-wheat crosses were made to develop a male-sterile line. Selection 8–21 will soon be released; it is high yielding and resistant to leaf rust. Sib matings were made in 364 $X_2$ populations of 8–21, which had received two treatments, with X rays and thermal neutrons. Some seed was obtained from 196 families and there was considerable variation in self fertility.

**Barley.** High yielding lines resistant to *Helminthosporium sativum* were obtained.

**Red clover.** A strain resistant to *Erysiphe polygoni* has been developed.

**Lupin.** The following chromosome counts were made: *L. luteus n* = 26; *L. luteus* var. *amaryllis n* = 26; *L. hartwegii n* = 25; *L. truncatus n* = 24; and *L. elegans n* = 24. No virus resistance was found in the $X_2$ generation of irradiated yellow lupin seed.

**Kenaf.** Several lines were found to be unaffected by natural infections of *Colletotrichum hibisci*. Sterility in *Hibiscus cannabinus* x *H. eetveldianus* was broken by colchicine treatment and an $F_2$ population was grown, with the intention of incorporating the root-knot nematode resistance of *H. eetveldianus* in a fibre type.

**Sansevieria.** The hybrid *S. trifasciata* x *S. deserti* [cf. XXVII, 2645] produced a good yield of leaves of adequate fibre length two years after planting from leaf cuttings, compared with four years required by *S. trifasciata*. The insensitivity to sunlight of *S. deserti* appears to be dominant. Wide variation was found in backcross and $F_2$ populations of *S. trifasciata* x *S. deserti*. Hybrids of *S. trifasciata* x *S. ehrenbergii* were obtained.

**Tobacco.** 864 (Rg x White Honduras, $B_3$) was found outstanding for resistance to *Phytophthora parasitica* var. *nicotianae*, yield and quality. Other lines combined resistance to *Ph. parasitica* var. *nicotianae* with resistance to *Meloidogyne* spp., *Peronospora tabacina* or *Xanthomonas solanacearum*.

**Capsicum.** Hybrids resistant to two viruses have been developed.

**Tung.** Selections were made for high yield, late flowering and resistance to low temperatures in the flowering stage. The *Aleurites montana* x *A. fordii* hybrids were found unsatisfactory in yield and fruit quality, but their pollen is to be used in the production of late flowering and low-temperature resistant lines.

**Peach.** The Southland x Hawaiian $F_2$ gave heavy crops, and some lines ripened early. Further selection is in progress. Hybrids were made between Florida varieties with a low temperature requirement and Northern types. An introduction from Okinawa with high root-knot nematode resistance gave high yields and required little chilling.

**Citrus.** Two strains of rough lemon tolerant of burrowing nematode and one resistant orange tree were multiplied for further testing. A large number of selections of lemon, chiefly from the varieties Lisbon, Eureka and Villafranca, are being used to produce disease-free nucellar strains; some of these were budded on to rough lemon rootstocks. Five promising lemon selections were grafted on to lemon, orange and mandarin rootstocks, to determine the effect of the rootstock on fruit quality.

**Rubus.** Hybrids of *R. albescens* x Manteo, Cumberland and Evans black raspberries have not done well. Selections of the dewberry Regalness x X9 selected for early fruiting have grown well and produced large fruit of good quality. *R. urticaefolius* (PI200757) from Guatemala has produced large, good-flavoured fruit; it is suitable for crossing with *R. albescens.*

**Blueberry.** Promising hybrids were obtained from Florida evergreen blueberry crossed with northern highbush and rabbiteye types.

**Strawberry.** Promising selections from crosses reported in XXVII, 2645 are to be back crossed with Missionary to secure early fruit production. New crosses made in 1956–7 are: Dixieland x Florida Ninety, Lassen x Florida Ninety, Florida 45 x Florida Ninety and Florida 45 x Dixieland.

**Grape.** Selections 1001 and 1004 have continued to do well [cf. XXVII, 2645]. Tetraploid wood from Lake Emerald gave vigorous growth when grafted on diploid Lake Emerald and other promising lines.

**Celery.** The line B.G.56–135 from Everglades was found outstanding in plant size and resistance to *Cercospora apii.* Some Zellwood lines were found resistant to *Cercospora*, *Septoria*, bolting and black heart. Selections were made for resistance to premature seeding.

**Watermelon.** Thirty selections, highly resistant to *Fusarium* wilt, were made in $F_2$ progenies from crosses made in 1953 and from fourway crosses made in 1955. Black-seeded Garrison-type segregates were particularly promising. Crosses were made between Florida lines with high resistance to *Fusarium* wilt and high-quality lines from other sources.

**Cantaloupe.** Three promising lines, 27–13, GA and CX, were crossed with an Ethiopian melon and an $F_2$ was grown. Line 27–13 was found to give high yields of good quality fruit and to have high resistance to *Pseudoperonospora cubensis*, *Erysiphe polygoni* and *Alternaria* sp.

**Cucumber.** Two experimental lines, SC 50A–8 and SC 50E–4, compared favourably with Ashley and Stono for fruit quality. These lines and SC 50 C7 were found highly resistant to *Pseudoperonospora cubensis.* Palomar is expected to replace Marketeer on account of its high yield, good quality, and resistance to *Ps. cubensis.*

**Tomatoes.** Immature tomatoes were harvested and varietal differences recorded for firmness, damage sustained during handling and ripe colour. In the autumn trials, the Gulf Coast Station lines 80–3–BK–BK–3–BK, 131–12–1–BK–BK–BK and 131–12–1–BK–FP1–BK produced large, good-quality fruit in green and vine-ripened harvests. Manalucie produced the largest fruit. In the Southern Tomato Exchange Programme, the following lines were outstanding: STEP 194 (Texas), STEP 209 (Charleston) and GCS STEP 250, which was found highly resistant to cracking. In the spring trials, GCS lines 80–3–BK–1–5–BK–BK and 80–3–BK–1–1–BK and the commercial varieties Manalucie and Jefferson gave the best all-round performances. C St W 80–3–BK–1–5–BK–BKA will soon be released as a new variety. It is resistant to cracking and catface, high yielding and suitable for the harvest of mature green and vine-ripened fruit. Selections were obtained which combine good horticultural characters with resistance to tobacco mosaic. The lines CST MW 55–3–2–BKA and CASTW 131–12–1–BK differ by three recessive genes for the reaction to tobacco mosaic.

**Beans.** Two wax-bean lines, 101 B and 101 W, are being increased for further testing. Three new selections have excelled these lines in appearance. Attempts are being made to produce: (1) white-seeded, mosaic-resistant, Tendergreen lines; (2) bush lines with Blue Lake pods; (3) bush lines with high-borne pods; (4) pole bean crosses which combine the good qualities of McCaslan and Florigreen; (5) stringless, rust resistant, round-podded lines and (6) Blue Lake lines with short pods and with Florigreen rust resistance.

It is intended to produce a hypogeal germinating lima line using the hybrids, *Phaseolus vulgaris* x *Ph. xanthotrichus* and *Ph. lunatus* x *Ph. polystachys*, and other *Phaseolus* species.

**Pea.** Progenies of Emerald were crossed with other lines as a basis for further selection.

**Sweet corn.** Screening for resistance to *Helminthosporium turcicum* was continued with a large number of hybrids, inbred lines and introductions. Eleven resistant hybrids, with other promising characters, are to be further tested. A mutant factor, $Sh_2$, is reported to produce high sugar content in the endosperm; it will be incorporated in some inbred lines.

176 **Push ahead on many fronts. Oat Rice-Pasture Experiment Station.**
Rice J. 1957 : **60** : No. 7 : 14, 16.

A new ryegrass strain giving high yields of forage is undergoing trials at the above station in Texas. It is early maturing and possesses a high degree of rust resistance.

High yield, early maturity, shortness and stiffness of straw, disease resistance and salt tolerance are among the aims of the rice breeding programme.

177 **Results of research in 1955 by the Agricultural Experiment Station of the University of Kentucky. 68th Annual Report of the Director** : Pp. 118.

**Maize.** The hybrids Ky104 [(Ky106 x R32) x (K4 x L317)] and Ky204 [(K55 x Ky201) x (33–16 x K64)] were added to the recommended list. Ky104, a yellow maize, has outyielded US13 but is later in maturity and more susceptible to lodging; it is suitable for grain production in eastern Kentucky and for silage in the whole of the state. The white hybrid Ky204 is equal to US523W in yield, slightly later in maturity and better as regards lodging resistance.

**Grasses.** The superiority in palatability shown by a synthetic of tall fescue (*Festuca arundinacea*) over strain Ky31 and inbred lines is noteworthy; the synthetic consisted of 8 inbreds crossed in isolation.

Most $F_1$ hybrids of ryegrass (unspecified) x tall fescue were ♂ sterile. Plants of the $BC_1$–$BC_4$ have been established for evaluation of palatability. $F_1$ hybrids and first back crosses have been treated with colchicine in an atempt to obtain ♂ fertile forms.

**Red clover.** Seedling inoculation with mixed cultures of *Colletotrichum trifolii* and *Stemphylium sarcinaeforme* offers a more rigorous means of selection for resistance than separate inoculations. As measured by survival of mature plants when inoculated with *C. trifolii*, selections obtained by the above method were about 23% more resistant to this disease than the original varieties.

**Tobacco.** The old commercial varieties Barnett Special and Warner and several breeding lines exhibited a high degree of resistance to *Pratylenchus scribneri*.

Failure to obtain lines homozygous for black-shank resistance from back crosses of hybrids between *Nicotiana tabacum* and *N. longiflora* is ascribed to embryo abortion; probably a region of the *N. tabacum* chromosome essential for embryo development was lost during translocation of the part of the *N. longiflora* chromosome involved in the inheritance of resistance.

By back crossing, lines of dark tobacco have been developed which possess resistance to mosaic, wild fire and *Fusarium* wilt and the *N. debneyi* gene for immunity from black root rot. It has not yet been determined whether this gene has been incorporated in an *N. tabacum* chromosome in such a way that it will be transmitted in a regular manner.

Total production of alkaloid is apparently due to four pairs of "nondominant" genes, three of which have minor effects while the fourth has a major effect. Modifiers and environmental factors influence the action of these genes in as yet undetermined ways.

Fairly acceptable lines of burley with low nicotine content have been developed. The $F_2$ of crosses of such lines with others having high nicotine content segregate for various concentrations of nicotine. Past experience has shown that nicotine content may be stabilized at almost any desired level; it should therefore be possible to establish nicotine concentration as desired in disease-resistant and otherwise satisfactory varieties.

**42nd Annual Proceedings of the Ohio Vegetable and Potato Growers Association. 1957** : Pp. 155.

178 *Alexander, L. J. Researches for the control of diseases of greenhouse tomatoes.* (*pp. 81–84*).

Mention is briefly made of breeding for resistance to *Fusarium oxysporum* f. *lycopersici*, *Cladosporium fulvum* and mosaic in the USA.

179 *Ounsworth, L. F. Greenhouse vegetable production and research in Canada.* (*pp. 94–101*).

Progress made in Canada in breeding tomatoes resistant to *Cladosporium fulvum* is briefly surveyed.

180 *Bushnell, J. Rating of potato varieties on earliness, yield, chip quality and freedom from hollow heart.* (*pp. 123–28*).

Tabulated data are provided on the yield, hollow heart incidence, specific gravity, colour rating of crisps and tuber shape of 25 varieties tested at the Ohio Agricultural Experiment Station together with comments on the performance of six of the varieties tested.

181 **Report of Research Progress at the Illinois Agricultural Experiment Station, University of Illinois, 1954-1956** (1957) : Pp. 143.

**Wheat.** Differences were found between four winter-wheat varieties in respect of their response to planting rates and nitrogen level in a three-year trial at six localities in Illinois. Resistance to *Septoria tritici* has been found in some *Triticum durum* varieties. Different types of resistance to race 11 of *Ustilago tritici* have been found in Wabash and Kawvale winter wheats.

**Oats.** Mention is made of the release of Logan [cf. XXVI, 3218]. In a study of the host-parasite interaction of eight varieties infected with race 202 of *Puccinia coronata*, the varieties were found to fall into four groups on the basis of external symptoms on inoculated leaves.

**Maize.** A number of inbreds and hybrids resistant to *Diplodia* stalk rot, smut and leaf blight or corn borer have been developed and progress has been made in the use of cytoplasmic male-sterile single crosses and fertility restoring double crosses in hybrid maize production. In a study on the inheritance of foliage leaf number using 58 inbred lines, five reciprocal crosses and two $F_1$ inbreds, early inbreds tended to have fewer leaves than later inbreds. Plants from reciprocal crosses usually had similar leaf numbers while those from inbred lines were highly heterogeneous and no heterosis for leaf numbers was observed. The percentage heritability of leaf number ranged from 44·90 to 70·38 and, while calculated statistical constants indicated that not more than two genes were operating in any cross studied, evidence from segregations suggested that a more complex inheritance was involved. A close correlation has been confirmed between resistance to *Helminthosporium turcicum* and *Xanthomonas stewartii*.

**White clover.** Plants of Ladino clover from seed lots from several states were shown to vary considerably in their cyanophoric properties and it was found in both field and greenhouse tests at Urbana, Ill., that many plants with cyanophoric properties flowered earlier and more profusely under short days than did plants without such properties. It is suggested that the fairly high percentage of cyanophoric plants from California may be explained by a genetic shift resulting from the natural selection occurring as a result of the shorter days in this state. Modification of the Ladino clover seed certification programme to minimize this genetic shift is recommended.

**Apple.** Controlled crosses have been made between selected diploid seedlings and tetraploid forms of McIntosh, Golden Delicious and Jonathan and also between tetraploid strains, chromosome counts being made in seedling root-tip material. Germination of triploid seed was relatively low, being 60·2% from McIntosh and 64·4% from Golden Delicious while seed viability from $4n$ x $4n$ crosses averaged 85%. Aneuploid seedlings comprised 8·3% of the 240 from $4n$ Golden Delicious x $2n$ seedlings and 7·1% of the 259 from $4n$ McIntosh x 2n seedlings. No aneuploids were found among 19 seedlings from $4n$ Jonathan but it is suggested that a large proportion of the aneuploids may have been eliminated by low seed viability. Aneuploids comprised 21·6% of the seedlings from $4n$ x $4n$ crosses and 75% of these aneuploids had more than 68 chromosomes. Weak seedlings occurred in almost equal proportions in all $4n$ seed parents but in highly variable proportions in their progenies and it is concluded that the depressing effect of tetraploidy on fertility is not sufficiently great to prevent the use of tetraploids in breeding.

**Raspberry.** Crimson Cone has been released [cf. XXVII, 875].

**Grape.** Some wild grape species have been found to possess resistance to black rot, caused by *Guignardia bidwellii*, and selections from these species are being crossed with susceptible, high-quality commercial varieties. Resistance to infection by foliage injections has been found to be inherited on a multifactorial basis.

**Oak.** After X irradiation at doses of 16,500 ± 2,500 r, morphological variations were found in the oak wilt fungus in the proportion of three mutants in irradiated cultures to one in control cultures. All the mutants were pathogenic.

**Asparagus.** The inheritance of resistance to *Puccinia asparagi* is governed by four or five genes, one of which is linked to a dominant gene inhibiting the development of anthocyanin in the spear. Selection for increased rust resistance has proved difficult owing to the low heritability of this character and to extreme variation due to environmental influence.

**Tomato.** A *Fusarium*-wilt resistant variety has been released under the name Blackhawk. Inheritance studies show that two recessive genes are involved in the inheritance of high pigmentation in tomato fruits.

**Lima bean.** A new gene affecting testa colour has been discovered and crosses between productive white-cotyledon types and commercial green-cotyledon strains have yielded a large number of new green-cotyledon selections.

**Sweet corn.** Several inbreds and one hybrid have been released for seed production.

182 Progreso realizado en las investigaciones agrícolas campaña 1954–1955. (**Progress attained in agricultural research in the season 1954-55**).
Idia 1956 : No. 106–108 : Pp. 303.

In addition to the work described below, varietal trials of potato, cassava, tobacco and other crops have been carried out and varietal collections at various stations have been maintained and enlarged.

**Microorganisms.** Biochemical and morphological mutants of *Bacillus subtilis* have been obtained through treatment with streptomycin and include strains distinguished by their different reactions to terramycin, aureomycin and chloromycetin.

Nuclei of different sizes have been observed in *Phytophthora infestans*. While most zoospores are uninucleate, a few are binucleate and are fully viable. It is thought that heterocaryosis may play an important part in causing variation in the organism.

**Wheat.** Gluten quality has been found to be quantitatively inherited in the cross Sinvalocho MA x Mentana and the reciprocal, three or four gene pairs being involved. The disease-resistant wheat Magnif MG [cf. XXVI, 2122] has been used in crosses with varieties of high quality resistant to lodging, including Massaux 5. The new variety Magnif Guaraní MAG, whose origin is given as (38MA x Lin Calel 46–11, Rafaela) x Klein Cometa, has been approved; it is characterized by high resistance to *Puccinia triticina* race 15, field resistance to *P. graminis*, good quality and high yield.

Evidence of biotypes of race 15 of *P. graminis* var. *tritici* distinguished by their virulence on additional differentials has been obtained.

Nearly all wheats cultivated in the country are susceptible to *Tilletia controversa* but some new selections, including Buenos Aires 105, are resistant. The foreign varieties Hussar, Hope, Martin, Oro, Ridit, Rio, Yogo and others are being used in breeding for resistance.

At Bordenave, the high-yielding drought-resistant hybrid Cheg 3X is proving a useful parent, as are also General Roca MAG and lines from Standard x Thatcher, Blackhull x Pental x Marquis and Sudoest [Southwest] x Eureka.

At Manfredi drought-resistant material equalling control varieties in yield has been selected from the crosses (Sinbar Benvenuto x Sinvalocho) x (Progreso [Progress] x Apulia), (Thatcher x Sinvalocho) x (Progreso x Apulia) and (La Estanz. x R6–1–2) x (38 x Vencedor [Victor]).

At Pergamino the new variety Pergamino Gaboto MAG, resistant to races 15 and 20 of *P. rubigo-vera* var. *tritici*, to races 11, 15 and 17 of *P. graminis*, to loose smut and to *P. glumarum* has been developed from crosses involving the hybrid H44 x Sinvalocho and two Brazilian lines from Bagé. It is more resistant to lodging than Klein Cometa, which it is intended to replace. Promising hybrids at Rafaela and Tezanos Pinto are mentioned.

**Oats.** By means of a new differential series, thirteen races of *Puccinia coronata* have been identified in Argentina, falling into three groups referred to as Arg. 1, Arg. 45 and Arg. 55. Among white and yellow-grained forms obtained from *Avena byzantina* x *A. sativa*, no relation between grain colour and suitability for use as fodder or as grain was observed. Santa Fe 2 and Santa Fe 3 have shown resistance to *P. coronata*.

**Rye.** The selection M1 is earlier and has given higher yields than its parental variety Común Pico. The perennial species *Secale montanum* grows vigorously from its second year onwards and is resistant to leaf rust. An $S_{10}$ inbred rye has proved highly resistant to *Schizaphis graminum* and some $F_{10}$ hybrid lines are not only resistant but highly repellent to this pest.

**Maize.** A most promising early variety tested originates from a cross between Santa Fe 3 and Gehn Flint.

All seedlings inoculated with *Ustilago zeae* have proved highly susceptible. No differences in virulence were found between two cultures of the pathogen from Pergamino and Castelar but differences in this and other characters were induced by ultraviolet irradiation. In sexual crosses between a strain adapted to growing on high concentrations of sodium arsenate and a nonadapted strain, the adapted character proved heritable. The hybrid Tezanos Pinto Cruza MAG [Tezanos Pinto Cross MAG] from Pergamino 2 x Colorado Manfredi MAG has proved particularly suitable for the Entre Ríos region. Synthetic bitter varieties have been produced at Tezanos Pinto. Back crosses suggest that the bitter character is determined by a single recessive gene, but in straight crosses an excess or deficiency of recessives occurs according to the direction of the cross.

**Barley.** Mutation rate was increased four or five times by treatment with formaldehyde and at concentrations of 1% for 2 hr. chromosome fragmentation was induced in root-tip cells. Although a marked lethal effect was noted, plants which reached maturity showed no diminution in ovule fertility. Unlike ionizing radiations, which induce chlorophyll mutations of the *albina* and *xantha* types, formaldehyde induced mutations of the *viridis* type. Among mutant plants, early and late forms and plants with a tough rachis and short straw have been selected. Among other substances tested, urethane had a marked lethal and slight mutagenic effect, streptomycin had only a lethal effect and sodium cacodylate induced c-mitosis. A decrease in male and female fertility and numerous translocations and fragmentations were induced by X rays, $\gamma$ rays from $Co^{60}$ and neutrons from $P^{32}$. In studies of seven lethal and semilethal mutants, six showed a decrease in yield in the heterozygous state as compared with normal homozygous individuals; the seventh was normal in yield.

All the genes found so far for resistance to the two Argentine races of *Erysiphe graminis* and to races prevalent in the USA, Japan and Australia lie in the second linkage group between two loci separated by not more than 50 units. The genes involved are: a complex called AC M, consisting of a series of alleles and pseudoalleles determining high resistance or immunity; a second, smaller, *P*, consisting of at least four alleles or pseudoalleles governing a lower degree of resistance; *Z*, which lies close to *P*, confers moderate resistance and is found in Palmella Blue and Teau, both from North Africa; and a new gene 15–25 units from ACM, found in Gopal. A gene distinct from those previously known has been found in CI 3576 and Mubyan.

Bordenave Ranquelina MAG, a new semiearly fodder barley developed at Bordenave from the cross (Primor x Trebi) x Massaux EM, gives high yields of both green matter and grain and is resistant to *Rhyncosporium secalis*, *Helminthosporium* (*Pyrenophora*) *teres* and *Ustilago nuda* but susceptible to *Puccinia anomala*, stem rust and mildew; it is also fairly resistant to lodging.

**Sorghum.** Varieties resistant to *Pseudomonas andropogoni*, *Xanthomonas holcicola*, *Ps. syringae* and *Colletotrichum graminicola*, are listed. Selection for increased resistance to *Diatraea* is being effected in Early Kalo and Spur Feterita. Selections with improved panicle length, yield of grain and green matter and shorter stature than local material have been developed.

**Grasses.** At Anguil selections with good vigour and regenerating capacity have been selected from among local material of *Bromus brevis*; the species appears to be largely autogamous. *B. cartharticus* 'Pergamino Martín Fierro MAG', selected from a local population, has yielded 50% more forage than common varieties and produced abundant seed.

In work on *Phalaris*, Fo. 1706, developed by mass selection, has shown good forage qualities in trials, as have also a commercial hybrid of *Ph. tuberosa* x *Ph. arundinacea* and the fertile allotriploid *Ph. tuberinacea*; the latter has outyielded *Ph. tuberosa* by 80%. At Oliveros *Ph. minor* 'Pergamino El Gringo' has proved productive and good in quality. The new variety *Ph. perenne* 'Pergamino Alejandro Botto MAG' is vigorous, gives high yields of forage and is resistant to shattering.

A new productive, semiearly sweet sorghum, with low toxicity, good palatability to stock, resistance to lodging and leaf diseases and rather short stems 1·6–1·8 m. in height, has been developed; it is named Oliveros Carcarañá MAG.

Two natural hybrids found in Tierra del Fuego both have $2n = 28$ and irregular meiosis; they appear to result from crosses between *Agropyron* and *Hordeum* and between *Elymus antarcticus* and *Hordeum*, respectively.

**Lucerne.** Fourteen lines from S3 have shown good combining ability and are being used to produce a synthetic variety. Clone 55–6 appears to be resistant to a new mosaic virus. At the Plant Breeding Institute selection for resistance to stem nematode is being carried out in the variety Scantamburlo and at the Institute of Plant Health six highly resistant inbred lines have been developed and are being used in the production of a synthetic variety. Nineteen resistant lines have been selected at the Junín substation.

**White clover.** A new variety, Pergamino El Lucero MAG [Pergamino Morning Star MAG], distinguished by vigour, aggressivity and high forage yield, has been developed.

**Cotton.** In transferring the fibre quality of Coker Wild 18, Sealand 542, Stahman's Messilla Acala and Giza 7 to the productive early varieties Sáenz Peña 61 and Las Breñas 771, an improvement in quality has been accompanied by a decrease in ginning outturn.

At La Banda the selections J. Brebbia 83 and J. Brebbia 830 have continued to do well in trials and have been used as recurrent parents in a back-crossing programme with the Egyptian varieties Karnak and Ashmouni and with *Gossypium arboreum* varieties. The new selection, LA–G, from the cross LA(G–14–056 x 948–01–15), resembles J. Brebbia 83 and J. Brebbia 830 in productivity, ginning percentage, length and strength of fibre, equals Stoneville 2B in earliness and is characterized by uniform opening of the bolls. Promising material has been selected from back crosses of hybrid lines involving J. Brebbia 73, J. Brebbia 83 and J. Brebbia 88 on the one hand and Pi 32, Sb, 12B2, S x P and LM7–35, which are distinguished by long and fine fibres, on the other.

At Las Breñas, attempts are being made to introduce the fineness and strength of fibre of *G. barbadense* varieties into the local selection Las Breñas 771. *G. thurberi* has been crossed with the last-mentioned and other varieties. Advanced generations of crosses of Sáenz Peña 56, Sáenz Peña 758, Sáenz Peña 61 and Sáenz Peña 85 with long-fibred varieties show good fibre qualities but are less productive than Sáenz Peña 85. A few seeds have been obtained from crosses of *G. hirsutum* 'Sáenz Peña 85'

($n = 26$) with *G. thurberi* and *G. klotzschianum* var. *davidsonii*, both with $n = 13$. The last-mentioned species is resistant to *Platyedra gossypiella*. Crosses between American and Asiatic 13-chromosome species showed greater fertility. A new wilt-resistant variety, Sáenz Peña M58, is being multiplied. It was developed by combining M05, M06, M07 and M09, all progenies of the female parent Coker 100 Wild 5.

**Flax.** A new variety, Oliveros Toba MAG, is characterized by earliness, resistance to *Fusarium lini*, immunity from rust and its high yielding capacity even under conditions of drought. Another new flax, Pergamino Flandes MAG, developed from a number of crosses involving Achay, 10678–3 and other varieties, combines resistance to rust, wilt, *Septoria linicola* (*Mycosphaerella linorum*) and lodging and gives good yields of high-quality fibre.

At Tezanos Pinto, Bombay CI 42, which carries a single dominant gene for immunity from rust races 19, 22, 40 and 42 is being used as a source of resistance. Other introduced material is proving useful in breeding for resistance to *S. linicola*.

**Willow.** Plantations of *Salix alba* var. *calva*, which is susceptible to *Marsonina salicicola* and *M. kriegeriana*, are being replaced by natural hybrids between *S. humboldtiana* ♀ and *S. babylonica* ♂ or *S. alba* var. *calva* ♂. Segregations for growth and disease resistance occurred in the $F_1$ progenies of artificial interspecific and intraspecific crosses. The hybrids 11–1 and 12–4 are being multiplied and 11–1 is being treated with formol to induce mutation and colchicine to induce polyploidy.

**Sugar cane.** At Villa Alberdi the new varieties VA571, VA6160, VA6151 and CB40–69 have exceeded common varieties in growth and vigour and are resistant to frost. Varieties resistant to mosaic are listed.

***Capsicum.*** A vigorous productive form has been selected from Pimiento de Quintero [Farmer's Red Pepper].

**Linseed.** Pergamino Puelche MAG (H8–2–10–1–1–2 x 7223–1), a new variety intended to replace Charrúa, is resistant to *Septoria linicola* (*Mycosphaerella linorum*) and lodging, is immune from rust, has a high oil content and yields well.

**Sunflower.** Material combining resistance to *Puccinia helianthi* and *Albugo tragopogonis* has been selected from *Helianthus annuus* x *H. cucumerifolius* and *H. annuus* x *H. agrophyllus* at Manfredi. At Pergamino, North American and local strains are being used as sources of resistance to *P. helianthi* and *A. tragopogonis* respectively.

**Kok saghyz.** Ultraviolet irradiation of soaked seeds resulted in more rapid germination and gave bigger and heavier plants. Selection is being practised in introduced material.

**Fruit trees.** Scab-resistant apples have been raised from seed of interspecific crosses introduced from Purdue University, USA.

Early-ripening vigorous peach lines have been selected from Elberta, Prisco Francés, Elberta x Brigg's Red May and Elberta x Mayflower Nozzi and are awaiting further testing for quality and productivity.

**Groundnut.** In breeding for resistance to fungous diseases and sprouting, three promising $F_8$ lines, Mf. 1, Mf. 2 and Mf. 3, have been obtained from a cross between the Corrientes strain tipo 4 [Type 4] and the North American line Fl$^{a}$249–40–B–3. Fertile interspecific hybrids with regular meiosis have been produced between *Arachis hypogaea* and *A. monticola* ($2n = 40$), the latter being a productive, annual wild species vigorous in growth, resistant to sprouting and free from diseases of root and fruit; it is, however, susceptible to *Cercospora* and has undesirable fruit characters. It is suggested that the centre of origin of the cultivated groundnut may be the plateau of north-western Argentina and Bolivia, where the only known annual wild species occur.

**Olive.** At Bordenave the variety Frantoia was distinguished by its resistance to anthracnose and its high yield of oil.

**Grape.** Large seedless fruits have been found among some $F_1$ hybrids from crosses of Bicané and Aluck with Sultanina blanca [White Sultanina]. Clonal selection has been effected among local varieties.

Seedlings resistant to local races of *Plasmopara viticola* have been selected from open-pollinated direct-producer hybrids. A small proportion of resistant plants has also been found among the progeny of local *Vitis vinifera* material.

**Forest trees.** *Cupressus sempervirens*, *C. funebris*, *C. lusitanica*, *C. macrocarpa* and *C. torulosa* all possess 22 somatic chromosomes, two of which have a secondary constriction. *C. glabra*, also with $2n = 22$, has a small supernumerary chromosome with a centromere.

In developing early, disease-resistant poplars adapted to various regions, samples of female trees, which are rare in Argentina, have been collected and multiplied by grafting on to balsam poplars; a number of crosses have been effected.

**Vegetables.** Three new onion lines, of which No. 1 is being multiplied for distribution, have proved superior to Valencia in freedom from bolting and other defects and in keeping capacity.

The new compact-headed cabbage selection Magnif 33 has done well in trials.

Three high-yielding uniform lines of *Cucurbita maxima* have been selected.

Tomatoes of the Platense type selected from San Marzano x Agro have shown promise and Magnif Potente, of the same type, has transmitted its productivity and vigour to the progeny when used as male parent. In refractometric studies of 150 varieties, the highest values were shown by Perfeição [Perfection], Yellow, Garrafinha [Bottle] and some wild forms of *Lycopersicon esculentum* and *L. pimpinellifolium*. Significant intravarietal differences in dry matter content have been found, suggesting that selection for this character may be effective. In ten different crosses, dry matter content was influenced by the pollen parent. Some high-yielding hybrid lines with good fruit characters produced at the J. J. Gómez Experimental Station are referred to.

A pea line from 40 días [40 Days] x Fabriquera [Canning] has proved vigorous, productive and suitable for canning.

183 PLOTNIKOV, N. JA.
**(An eminent scientist and breeder).** Zemledelie (Agriculture) 1957 : No. 9 : 78–79. [Russian].

This biography of P. N. Konstantinov, written on the occasion of his eightieth birthday, refers to his breeding work on cereals and forage plants. The results include productive and drought-resistant wheats such as Melanopus 69, Hordeiforme 189 and Erythrospermum 841.

**Genetics in plant breeding. Brookhaven Symposia in Biology 1956** : No. 9 : Pp. 236.

184 *Sears, E. R. The transfer of leaf-rust resistance from* Aegilops umbellulata *to wheat.* (*pp. 1–22*).

From a cross of *Triticum aestivum* with the amphidiploid of *T. dicoccoides* x *Ae. umbellulata*, followed by two back crosses to *T. aestivum* combined with selection, a plant was obtained which had the full complement of *T. aestivum* + one *Aegilops* chromosome and which was resistant to *Puccinia triticina*. The *Aegilops* chromosome had deleterious effects upon vigour and pollen fertility, and, in contrast to the retarding effect of the genome of *Ae. umbellulata* as a whole upon maturity, it brought about a tendency towards earliness. Plants with an added derived isochromosome for the resistance-carrying arm were X irradiated prior to meiosis and their pollen was used in crosses with normal untreated plants. Of the 6091 plants thus obtained, 132 were resistant, 40 of which contained a translocation involving the *Aegilops* chromosome. At least 17 different translocations were represented. Data from translocation 36 indicated that the deleterious genes were all located distally to the resistance gene which was situated close to the centromere. The reciprocal translocations therefore presumably all involved almost an entire arm of the *Aegilops* chromosome, including the deleterious genes. The rate of male transmission of the reciprocally-translocated chromosomes from heterozygotes with $21_{II}$ ranged from about 2 to over 35%. Possibly the following is the most satisfactory explanation of the unexpectedly high rate of transmission in some cases: absence of the wheat segment tended to cancel the deleterious effects of the *Aegilops* segment, assuming that the former segment possesses some genes in common with the latter and that these genes are deleterious when present in overdose. Probably only one of the translocations was intercalary; it showed essentially normal pollen transmission and was cytologically undetectable. Plants homozygous for this translocation were distinguishable from normal plants only by their leaf-rust resistance and slightly later maturity.

185 *Anderson, E. G. The application of chromosomal techniques to maize improvement.* (*pp. 23–36*).

The particular value of chromosomal techniques for the breeder lies in the transference of desired major genes which are not readily detected without markers.

After surveying the types of genes and chromosomal alterations available for these techniques, the author discusses the determination of the sites of genes by means of gene-marked and unmarked translocations and by methods dependent upon the expression of a gene in the hemizygous condition. Once the position of a desired gene has been tagged with a marker translocation, with or without the supplementary aid of a marker gene for the translocation, the gene may be transferred to inbred lines by the following method of recurrent back crossing. The $F_1$ of the cross between a translocation stock carrying the gene and the inbred is back crossed to the inbred parent, using semisterile heterozygous plants in each generation. When the conversion has reached a satisfactory stage, stock homozygous for the translocation is developed and used "in place of the inbred line in a cross with the desirable gene and also in the back-crossing programme. This time semi-sterility will mark the normal chromosome which carries the gene. When sufficiently converted the translocation chromosomes can be eliminated, which would leave the converted stock homozygous for the desired gene." Since a given translocation may be used to mark two chromosomes, it should also be possible to transfer simultaneously two independent genes in the same stock, by means of twice the number of successive generations required for simple conversion of an inbred. A discussion is given of the effectiveness of the use of chromosomal techniques for detecting and locating genes for agronomic traits, reference being made to a few preliminary tests, whose results include the following discoveries: two genes in inbred C289 for susceptibility to "firing" under summer conditions in California, one in chromosome 2 and the other probably in chromosome 3; a gene affecting lodging or reaction to stalk rot on the long arm of chromosome 2 in L289; a locus in chromosome 10 responsible for part of the difference in chlorophyll production between CC5 (light green) and L317 (dark green); a recessive gene for lateness in the distal region of the long arm of chromosome 10 in inbreds Kys and Ky27; and a gene for restoring fertility to the T type of cytoplasmic male sterility, situated in the long arm of chromosome 3. The author concludes with an examination of problems involved in the choice of translocation stocks for use in gene transference and of the scope of chromosomal techniques. Such techniques are not expected to replace conventional methods of maize breeding but are valuable as a means of introducing major genes for specific traits into highly selected inbred lines.

186 *Stebbins, G. L. Artificial polyploidy as a tool in plant breeding.* (*pp. 37–52*).

Important examples of economically-valuable induced polyploids are surveyed. Among autopolyploids, tetraploid rye, Alsike clover and grapes, triploid sugar beet and water melon and tetraploids of various ornamentals are regarded as the most successful. The initial product of any autopolyploidization, even when possessing some advantages over its diploid progenitor, has however many disadvantages which may be removed only by intervarietal hybridization and selection. Amphidiploids have been even less successful as new crop plants because of sterility resulting from interactions between the parental genes. The most promising use of induced polyploidy is thought to be in the breaking down of interspecific-hybrid sterility, when transference of genes for disease resistance and other desirable characters is required. The author enlarges upon Randolph's suggestion [cf. XII, 76] that a potential use of induced polyploidy lies in the partial stabilization of vigorous and useful gene combinations intermediate between those of the parental diploids. Such stabilization is brought about by three factors: (1) the smaller contribution of each gene to any quantitative character at the tetraploid level, (2) tetrasomic inheritance and (3) preferential pairing. Work on *Dactylis glomerata* by the author and G. D. McCollum has indicated that, as the result of induced structural alterations in the chromosomes, preferential pairing may be increased in the progeny of intervarietal hybrids by the use of irradiated pollen in the original cross. Finally, it is suggested that the best guide to the successful use of polyploids in breeding is knowledge of the characteristics which have made natural polyploids successful. From such knowledge the most important conclusions reached are as follows: (1) polyploidy is most likely to be helpful when the aim is to produce entirely new properties or to extend cultivation of a crop into a region where previously it has been unsuccessful and (2) any programme of breeding for new polyploids should include a comprehensive series of hybridizations so that the maximum gene pool may be obtained for selection at the polyploid level.

187 *Cockerham, C. C. Analysis of quantitative gene action.* (*pp. 53–68*).

Two experimental designs, the diallel cross and crossing one male plant to a set of different female plants, are discussed to exemplify how genetic information can be obtained from the covariances between relatives. Special attention is paid to estimating the importance of epistasis.

188 *Allard, R. W. Biometrical approach to plant breeding.* (*pp. 69–88*).

The applicability to plant breeding of diallel analysis, factorial analysis of metrical characters and partitioning of variance into genetic and environmental components is reviewed and exemplified by results obtained with Lima beans and wheat.

189 *Lewis, D. Incompatibility and plant breeding.* (*pp. 89–100*).

In relation to breeding various crops, the author discusses different systems of self incompatibility and the impact of polyploidy upon them, disruption of incompatibility systems by means of induced *S* mutations, and interspecific barriers involving pollen inhibition.

190 *Jones, D. F. Genic and cytoplasmic control of pollen abortion in maize. (pp. 101–12).*

A résumé is given of the information so far gained in the USA on the above role of genes and cytoplasm. At least ten sources of cytoplasmically-controlled pollen abortion in markedly different varieties from widely-separated regions are now being studied. Two sources have been shown to be distinct, as indicated by differences in their reactions to dominant pollen-restoring genes. These two sources have been designated S and T and were respectively derived from a teopod strain and the variety Mexican June. Dominant pollen-restoring genes are of infrequent occurrence. They differ in ability to restore fertility to S and T lines and their expression is influenced by modifiers contributed by both the restoring and sterile inbreds. The pollen restorers are distinct from the dominant genes for pollen fertility which are normally present in maize and which frequently mutate to the recessive condition. The cytoplasm responsible for sterility is in itself unaltered by the pollen restorers, as shown by the behaviour of lines from which these genes have been removed by out crossing and back crossing. It has been established that dominant alleles for fertility have no ability to restore cytoplasmically sterile lines and that dominant fertility-restorers have no ability to restore pollen production in homozygous recessives for sterility.

191 *Gabelman, W. H. Male sterility in vegetable breeding. (pp. 113–22).*

Mainly with reference to the literature reporting American work, the different types of male sterility in vegetables and their modes of inheritance are surveyed. In connexion with the use of male-sterile lines in the commercial production of $F_1$-hybrid seed, the author discusses the following problems; the phenotypic stability of various types of sterility, development and maintenance of male-sterile lines, restoration of pollen fertility in vegetables grown for their fruits, sources of male sterility and possible ways of inducing this condition. Cytoplasmically-inherited male sterility occurs rather infrequently, in contrast to spontaneous mutation causing pollen abortion. Wide crosses may offer a means of synthesizing forms with cytoplasmic sterility, as suggested by the results obtained by some investigators from interspecific crosses in *Epilobium*, *Nicotiana* and *Beta*.

192 *Anderson, E. Character association analysis as a tool for the plant breeder. (pp. 123–40).*

Interspecific differences may be regarded as "multiple-sense-impression problems" and they have not as yet been effectively dealt with by conventional statistics. Natural variability of wild populations in North America is regarded by the author as almost exclusively the immediate result of introgression rather than of mutation. With an analysis of *Uvularia* spp. as an example, pictorialized scatter diagrams for five to ten variables are presented as an efficient way of measuring interspecific differences and of analysing variation in hybrid swarms or variable populations. With reference to *Oxytropis albiflorus*, the author demonstrates how the determination of complexes of associated characters in populations may be employed in the determination of an introgressive ancestor. It is suggested that analysis of variation by means of pictorialized scatter diagrams and allied techniques is of value in (1) the planning of breeding programmes, (2) the simultaneous analysis of differences in several characters in breeding material and (3) the determination of former introgressions in cultivated plants by means of information on complexes of associated characters. In the field of (3), promising beginnings have been made with maize, hops, sorghum, beans, cucurbits, coffee, sunflowers and cassava. Two of these analyses are discussed in detail: G. F. Freytag's work on *Phaseolus vulgaris* [XXVI, 1896] and an analysis of hops by E. L. Davis [XXVII, 3349].

193 *Mac Key, J. Mutation breeding in Europe. (pp. 141–56).*

Chiefly with reference to published work, the author compares the mutation spectra induced by different chemical and physical agents, and mutation spectra of spontaneous origin with those of artificial origin. He then gives examples of economically valuable mutations induced in various crops, concentrating on a few of the most important results obtained in Sweden, and makes suggestions concerning the limitations and special applications of the radiation technique.

194 *Konzak, C. F. Induction of mutations for disease resistance in cereals. (pp. 157–76).*

Dealing mainly with published research, this review is concentrated upon work on the induction of the above type of mutations at the Brookhaven National Laboratory, New York. At the locus in oats responsible for dominant susceptibility to Victoria blight (*Helminthosporium victoriae*) and also dominant resistance to certain races of *Puccinia coronata* var. *avenae*, a radiation-induced recessive change has been effected with retention of the crown-rust reaction typical of the unaltered locus. The different reactions of Victoria-blight resistant mutants of the oat Tama to three races of crown rust support the hypothesis that the locus in question is complex. Dominant mutations conferring resistance to stem rust have been induced in wheat and oats. In a recent experiment in Mexico, induced mutants were isolated which possessed different degrees of adult-plant resistance to a natural field-epidemic of stem rust; in this respect they were therefore similar to spontaneous mutants. Reported cases of induced mutation for resistance to other diseases in cereals and flax are mentioned. The author concludes with a discussion of some fundamental problems concerning the nature of the genetic changes responsible for induced mutants in general and with an assessment of the advantages of the mutation technique in crop breeding and of difficulties in its application.

195 *Gregory, W. C. Induction of useful mutations in the peanut.* (*pp. 177–90*).

Experiments on the induction of mutations by treating seeds, usually of Virginia Bunch, with 15,000 or 18,500 r. of X rays at the North Carolina State College are described. Mutants were obtained which were more resistant or more susceptible than the parent variety to two species of *Cercospora* limited in host range to the groundnut and other members of the subtribe Stylosanthineae. Mutants resistant to the highly nonspecific pathogen *Sclerotium* (*Pellicularia*) *rolfsii* were also secured. Heritable differences in resistance to primary injury due to X rays were detected among the mutants. Selected high-yielding mutants of normal appearance have maintained their superiority over the controls [cf. XXVI, 1756]; mutants tested in the $X_5$ have in general shown stability for the capacity to give high yields. Sib crosses of such stabilized $X_5$ mutants have shown a moderate degree of heterosis with respect to yield. A morphological mutant character such as "cup" is expressed in a series of grades of intensity. A uniform but extreme morphological mutant character such as "Hedera" showed graded variation in intensity of expression, when the mutant was reirradiated in the $X_6$. The author concludes that the genetic variation induced in the groundnut by X rays is polydirectional and quantitative in nature and that it offers a valuable means of obtaining phenotypically superior mutants.

196 *Harlan, J. R. Distribution and utilization of natural variability in cultivated plants.* (*pp. 191–208*).

It is suggested that populations derived from composite crosses resemble populations found in centres of diversity, since in both types introgressive breeding is occurring. On the basis of the successful results obtained from composite barley crosses [cf. XXVI, 3310], the far greater use of the composite-cross bulk population as a general method in crop breeding is advocated. In composite-cross populations of both barley and wheat, many variants with new and extreme characteristics have been observed even in advanced generations, in addition to numerous relatively normal variants. The diversity of unusual variants has in fact resembled that which would be expected as the result of irradiation. Composite-cross populations may therefore have the additional value of providing sources of new and exceptional variants. Concurrently with the production of a composite-cross population, the merits of the component varieties as parents may be determined by studying separately the performance of the bulk populations derived from the individual $F_1$ crosses which are combined for the development of the composite-cross bulk. The intrinsic value of items in world collections as parents could be surveyed in this way. It is stressed that members of a world collection of any crop should be examined for the genes they contain rather than as varieties competing with the best-adapted controls. The view is expressed that the variability available in existing collections is not being exploited to the full; desirable characteristics may often be discovered in the material at hand when suitable procedures are applied. Permanent preservation of world collections is advocated, in view of the great danger of extinction of old populations in the centres of diversity.

197 *Keitt, G. W. & Boone, D. M. Use of induced mutations in the study of host-pathogen relationships.* (*pp. 209–25*).

A review is given of major lines of progress in research on the changes in pathogenicity shown by induced biochemical mutants in bacterial and fungal pathogens, particular emphasis being laid upon the authors' own investigations on the nutritional aspects of host-pathogen relationships as indicated by the behaviour of mutants of *Venturia inaequalis*.

198 **Keppler, E.**
Züchtungsmethodische Untersuchungen an Populationen zweier Selbstbefruchter *Pisum sativum* L. und *Triticum aestivum* L. **(Investigations on breeding methods with populations of two self-fertilizing plants, *P. sativum* L. and *T. aestivum* L.).**
Z. Pflanzenz. 1957 : **37** : 375–420.

Material of a number of pea crosses was prepared in such a way that seed of $F_1$ to $F_6$ generations could all be sown in the same year and compared under the same environmental conditions.

Nine out of 13 different crosses showed heterosis for plant height in the $F_1$ generation and the others were all equal to the taller parent; the only crosses that did not show heterosis were some in which both parents were of equal height. The mean increase in height over that of the taller parent was 16%, the maximum being 37% in the cross Mansfelder Grüne [Mansfeld Green] x St. 192. In 6 of the crosses showing heterosis for height there was also an increase in seed yield. The yields of the $F_2$ were either intermediate between the parents or equal to those of one parent; in all crosses but one there was a strong correlation between the $F_2$ yield and that of the parents but no correlation between $F_2$ and $F_1$ yields. A further reduction in yield occurred in the $F_3$ and later generations; again in the $F_4$ and later generations there was no correlation with the $F_1$ yield, some of the families with the greatest heterosis in $F_1$ having the lowest yields in the $F_4$ and later generations. However correlations were observed between yields of the later generations and those of the $F_2$ in 15 out of 21 crosses studied.

Although the $F_1$ yields are not a direct index of the yielding potentialities of the succeeding generations they can, it is thought, give useful indications as to the components that contribute towards their increased yields.

Another set of three pea crosses is described in which selections were made in the $F_2$ and the results compared in the $F_4$ with the unselected populations; in two of the crosses the results were in good agreement whereas in a third the selections proved much superior to the other two whereas the unselected $F_4$ was slightly inferior.

In a further experiment comparisons were made of the $F_6$, $F_5$ and $F_4$ generations of seven winter-wheat crosses, all sown in the same year and compared with single-plant progenies from $F_5$, $F_4$ and $F_3$ plants selected at random. In all cases but one there was a falling off in yield in the successive generations. The yields of the different crosses judged by the populations and by the single-plant progenies agreed in some, though not in all cases; thus in the 21 comparisons between pairs, 12 of the crosses differed significantly according to the yields of the populations and of these, 9 differed also according to the yields of the single-plant progenies; the cases in which the two sets of data corresponded were those in which the differences were most marked. Individuals with maximum values appeared in populations with only medium averages but the chances of finding them were greater in populations of high value. The agreement between the behaviour of the $F_4$, $F_5$ and $F_6$ generations was satisfactory, not only in respect of yield but also for reaction to mildew, yellow and brown rust and lodging and for length of straw, time of earing, 1000-corn weight and baking quality. As regards quality the range of variation within the populations rose from the $F_3$ to $F_5$ and though the mean value for any one generation would give an indication as to the likelihood of its containing lines of high value, it showed no correlation with the extreme values that might be obtained from that population by selection. This conclusion was confirmed by artificial mixtures of two components, one with high and the other with low baking quality; the same mean test-number could be obtained from mixtures having quite different proportions. A comparison between 16 hybrid populations of spring wheat and the superélite and élite selections from them showed a good correlation between the yields of the best populations and those of the selections from them; however, several of those with medium or even low yields had given rise to some selections with quite good performance and not all the best élites came from the best superélites of the previous year. Better correlations between the populations and the selections from them were observed in respect of baking quality.

Two $F_2$ pea populations were selected for high and low pod number and compared after two years with the unselected progenies. The plus selections of the one cross had a mean pod number of 3·80 compared with 3·71 in the unselected progeny and 3·28 in the minus selections; in the other cross the values were 3·05, 2·95 and 2·28. No increase in the differences resulted from further selection. Artificial infection of a number of pea populations with *Ascochyta pinodella* and selection of the surviving plants led to no increase in survival in suceeding generations.

Selection of the 100 best-yielding ears in seven $F_2$ populations of spring wheat crosses also led to no improvement of yield compared with unselected progenies from the same populations. The author discusses his results in the light of those of other workers. The conclusion reached from the winter-wheat experiments is that a preliminary selection for the desired character, say baking quality, in the early generations would increase the possibility of favourable combinations emerging in the later generations, where the final selection should then be effected.

199 Pal, B. P. & Sikka, S. M.
**Exploitation of hybrid vigour in the improvement of crop plants, fruits and vegetables.**
Indian J. Genet. 1956 : **16** : 98–104.

In this review it is concluded that few Indian crop plants are as suitable as maize for the direct exploitation of hybrid vigour. It is suggested that more attention should be paid to methods using self incompatibility and male sterility and the building up of synthetic strains.

**A Conference on Radioactive Isotopes in Agriculture held on January 12, 13 and 14, 1956, at Michigan State University, East Lansing, Michigan.**
United States Atomic Energy Commission 1956 : TID 7512 : Pp. 416.

The section on radiobiological studies includes the following contributions of interest to crop breeders:—

200 *Sparrow, A. H. & Pond, V. Some cytogenetic and morphogenetic effects of ionizing radiation on plants.* (*pp. 125–39*).

A report is presented of investigations on the cytogenetical and morphological effects of chronic exposure to $\gamma$ rays at the Brookhaven National Laboratory, New York. Research on genetical effects has been confined to the study of somatic mutations in the leaves or flowers of various species. Particular emphasis has been laid on the frequency of somatic mutations in flowers of *Antirrhinum majus* after exposure to 0·1–285 r. of $\gamma$ rays per day for 1–4 months. Seasonal differences in the rates of both spontaneous and induced mutation were observed. In general, the results from the experiments on *A. majus* indicate that not only does the frequency of mutations induced by extremely low dose rates, e.g. 0·4 r. per day, show a significant increase over the control frequency, but that the frequency of induction may be disproportionately high at low dose rates, i.e. below about 10 r. per day. No adequate explanation of the latter response could be offered. In investigating cytological effects, a significant increase in chromosomal aberrations in *Lilium longiflorum* was obtained with a dose rate as low as 0·6 r. per day, as indicated by scoring the number of micronuclei at the quartet stage. The results of exposing plants of *Tradescantia paludosa* to 23·4 r. per day for 47 days in an outdoor $\gamma$ radiation field revealed that the chromosomes in germinal tissue are considerably more radiosensitive than those in somatic tissue. Of the various types of morphological effects observed, the enhanced production of tumours in *Nicotiana glauca* x *N. langsdorffii* as the result of chronic exposure to $\gamma$ or X rays, or of treatment with $\beta$ rays from $P^{32}$, is of particular interest.

201 *Shapiro, S. The Brookhaven radiations mutation program.* (*pp. 141–50*).

The above programme of the Brookhaven National Laboratory and cooperating organizations has the long-term objective of developing irradiation procedures and the application of these techniques in crop breeding. This account describes the origin and organization of the programme and the facilities available for irradiating growing plants, dormant buds and seeds. Chiefly with reference to published work, some of the special problems encountered and some results are discussed. Beneficial mutations have already been obtained in cereals and flax. Mention is included of an unpublished report of Mertens and Burdick who have found that seed pretreatment by soaking in calcium nitrate, cadmium chloride, lithium chloride or sodium chloride resulted in a considerable enhancement of the frequency of mutations in the third generation after thermal-neutron irradiation; this pretreatment did not however lead to an increase in the frequency of mutations in the case of X irradiation.

202 *Nilan, R. A. Factors governing plant radiosensitivity.* (*pp. 151–62*).

Literature throwing light on factors which alter the sensitivity of plants to X and $\gamma$ rays is surveyed. The following factors are discussed: genotype, age of tissue, stage of cell division, chromosome number, moisture content, temperature, oxygen and other gases, storage of seeds after irradiation, pretreatment with chemicals and ionization density. Special reference is made to the influence of such factors on the induction of genic mutation.

203 **Radiation and biology.**
Nature, Lond. 1957 : **180** : 628–30.

At the joint session of the sections for zoology, physiology and biochemistry, botany and agriculture of the British Association, held on 9 September 1957 to discuss the above subject, R. N. H. Whitehouse spoke on Radiation-induced mutations in crop improvement. He reviewed results obtained in Sweden and the USA in breeding mutant strains of cereals and oil plants and discussed the difficulties of breeding mutants of such vegetatively propagated crops as fruit trees. He regarded the use of radiation-induced variability as likely to be of value in (1) altering single characters in otherwise desirable varieties, (2) obtaining a specific gene known to exist but not available by other means, (3) extending variability and (4) breaking close linkage or effecting transference of characters through chromosome fragmentation.

204 Davies, D. R. & Bowen, H. J. M.
**Irradiation and plant breeding.**
Times Sci. Rev., 1957 : No. 25 : 3–4.

In this popular article, the authors assess the advantages and disadvantages of irradiation in crop breeding and describe some of the practical results so far obtained in Britain and other countries.

205 Michie, D.
**The Moscow Institute of Genetics.**
Discovery 1957 : **18** : 432–34.

In describing the activities of the above institute mention is briefly made of the transmission of hereditary characters by grafting.

206 Grafius, J. E.
**Biologic measurement of environment as an aid in selection.**
Agron. J. 1957 : **49** : 506–08.

"Two models for classifying environment using standard varieties to measure the environment were proposed. Various schemes for selection were discussed and it was shown that it is not always advantageous to save the best lines. This paradox becomes less incredible when, for example, one considers that if a variety performs well at cool night temperatures relative to another, the reverse may be true at high night temperatures. Data were presented to support this point." [Cf. XXVI, 2257].
[Author's summary].

207 **Handbook of Canadian cereal varieties 1956** : unpaginated.

Notes giving initial or revised descriptions of the following varieties have been issued for inclusion in the *Handbook of Canadian cereal varieties of barley, field beans, flax, oats, spring wheats and winter wheat* [XXII, p. 469]: the common wheats Chinook, Lemhi, Rescue, Selkirk and Thatcher; durum wheats Ramsey [XXVI, 3206] and Stewart; the oats Fundy [XXVII, 1657], Shield [XXVII, 3880] and Rodney; the barleys Nord, Swan [XXVII, 3880] and Traill; [XXVI, 3305]; the flax Wiera; and beans Sanilac [XXVI, 3564 and 3569] and Pinto CAN 3420.

Nord, a six-rowed, smooth-awned fodder barley developed in Canada from Byng x Olli, was licensed for sale in 1956. It is an early, large-grained variety adapted to northern Ontario and north-western Quebec.

Obtained from the US research Laboratory, Powell, Wyo., Pinto CAN 3420 is comparatively early in maturity and a good yielder; it is used chiefly for baking and for chili-con-carne. At Lethbridge, Alta, it has ripened ten days earlier than Michelite and shown considerable resistance to diseases.

208 Visser, T.
De kieming en bewaring van stuifmeel. (**The germination and storage of pollen**).
StudKring. PlantVeredel., Wageningen. Versl. **49** : 664–68.

In studies of apple and pear pollen, rapidity of germination *in vitro* was dependent on sugar concentration, temperature and age and method of storage of the pollen. The optimum sugar concentration was 10% and the optimum temperature 22°–25° C., or slightly higher in the presence of boron, which had a stimulating effect at concentrations of 0·01–0·001%. In storing pollen, a relative humidity of about 10% was most favourable and viability has been retained for two or three years at — 20° C. Tomato pollen could be stored for two years at — 20° C.

209 Sitte, P.
Bildungsabweichungen an wirteligen Sprossen und ihre entwicklungsphysiologische und genetische Bedeutung. (**Morphological abnormalities in whorled shoots and their significance in developmental physiology and genetics**).
Öst. bot. Z. 1957 : **104** : 234–302.

The frequency with which shoots showing abnormal numbers of leaves at the nodes occur in plants which normally have decussate or whorled leaves has been investigated in numerous species and is shown to differ according to species and variety. The abnormalities are due neither to environmental effects nor to mutation and are regarded as an effect of development and differentiation. The paper concludes with a discussion of the relation between gene action and developmental morphology.

210 Ševčuk, T. N.
**(Novelties of introduction).**
Bjull. vsesojuzn. Inst. Rasten. (Bull. All-Un. Inst. Pl.-Industr.) 1956 : No. **1** : 18–26. [Russian].

A number of additions made to the world collection of cultivated plants at Leningrad are described.

211 **(List of samples added to the Institute's collection from France, Argentina and Holland in 1954-55).**
Bjull. vsesojuzn. Inst. Rasten. (Bull. All-Un. Inst. Pl.-Industr.) 1956 : No. **2** : 45–75. [Russian].

A full list is given of the additions to the collection of crop plants at the Institute of Plant Industry, Leningrad, from the places named.

212 Müller, K. O.
Theoretische Betrachtungen zur Epidemiologie anemochorischer Pflanzenkrankheiten. **(Theoretical considerations regarding the epidemiology of anemochoric plant diseases).**
Z. PflKrankh. 1957 : **64** : 402–07.

The formula $D = A\ (c.P)^{T/t}$ is developed to express the development of a local population of an airborne pathogen, where $A$ is the number of infection centres of the pathogen at the beginning of its cycle, $c$ the number of viable shed spores per infection centre, $P$ the probability for an individual spore of infecting the host, $t$ the incubation time from the moment of contamination of the host to the appearance of the fructification organs of the parasite, and $D$ the number of infections attained in the time $T$. The values $P$ and $t$ are affected by the genotypes of both host and pathogen and the value $c$ by that of the pathogen, and any small changes in these values will result in marked differences in disease incidence.

213 Česnokov, P. G.
**(The work of the Institute of Plant Industry on immunity of agricultural plants from diseases and pests).**
Bjull. vsesojuzn. Inst. Rasten. (Bull. All-Un. Inst. Pl.-Industr.) 1956 : No. **2** : 18–20. [Russian].

In this brief outline of the work carried out with the world collections at Leningrad reference is made to the use of *Triticum timopheevi*, *T. fungicidum*, *T. carthlicum* and *Haynatricum* in wheat breeding and of potatoes resistant to *Spondylocladium atrovirens* and *Oospora pustulans.*

214 Pettersson, L. R., Ellis, S. K. F., Gray, G. E. J. & Smith, R. S.
**An inherent character of plant species of drier habitats.**
Nature, Lond. 1957 : **180** : 698–99.

In studies of six British genera, including *Poa*, conducted in 1955–57, intrageneric comparisons of species from damp and dry habitats reared in the same environment showed that the former had significantly higher fresh weight/dry weight ratios than the latter. It is suggested that if this relationship proves to be general it is likely to be of use in selecting for drought resistance.

215 Buxton, E. W., Last, F. T. & Nour, M. A.
**Some effects of ultraviolet radiation on the pathogenicity of *Botrytis fabae*, *Uromyces fabae* and *Erysiphe graminis*.**
J. gen. Microbiol. 1957 : **16** : 764–73.

The pathogenicity of the above three fungi was decreased by ultraviolet irradiation at a wavelength of 2537 Å but in all cases the effect of irradiation was mitigated by exposure to daylight after treatment. Ultraviolet irradiation of barley leaves before inoculation with *E. graminis* increased their resistance, while irradiation of broad bean leaves decreased their resistance to *B. fabae* but did not affect their reaction to *U. fabae.*

216 Oort, A. J. P.
Fysiologische specialisatie van schimmels. **(Physiological specialization of fungi).**
StudKring. PlantVeredel., Wageningen Versl. 1956 : **50** : 675–80.

The topics referred to in this survey include: passive resistance resulting in escape from infection through a simple physiological or morphological character; active resistance, in which a biochemical reaction of the plant cell to infection is involved; identification of physiological races; inheritance of resistance, the examples given being flax rust, cereal rusts and potato blight; and methods by which new races may arise.

217 Suhov, K. S.
**(The problem of hereditary variability in viruses pathogenic to plants).**
Agrobiologija (Agrobiology) 1957 : No. **1** : 36–53. [Russian].

The induction of directed changes in micro-organisms by culturing at increased temperatures or in mixed inoculation with other strains is reported from Gorki Leninskie [cf. XXVII, 3197]. A new strain of tobacco mosaic more virulent and another of cucumber virus A, less virulent than the initial strains, were obtained by the former method.

**Proceedings of the Third British Weed Control Conference held at Blackpool, England on November 6th-8th, 1956. 1–2** : Pp. 870.

218 *Elliott, J. G. The effect of MCPB and 2,4-DB on cereal crops. Part I. Winter and spring wheat.* (*pp. 399–408*).
Differences in susceptibility to damage by herbicides were noted between varieties of spring wheat sprayed at several localities in England. Abnormal heads occurred more frequently in Fylgia than in Atle or Bersée after spraying with MCPB and some differences were also observed in the leaf stage at which these varieties became resistant to 2,4-DB.

219 *Elliott, J. G. The effect of MCPB and 2,4-DB on cereal crops. Part II. Spring barley and spring oats.* (*pp. 409–15*).
Tabulated data are included on the percentage deformity shown by three oat varieties after spraying with MCPB and 2,4-DB. Forward was more susceptible to both herbicides than were Sun II or S225.
No reliable indication of differences in varietal susceptibility was obtained with barley.

220 *Reynolds, J. D., Proctor, J. M. & Hind, R. A. Studies with phenoxybutyric herbicides in peas, 1955–56.* (*pp. 499–513*).
Zelka and Servo are reported as being most resistant to damage by all compounds tested near Peterborough while Thomas Laxton and Gregory's Surprise were the most susceptible.

221 *Carpenter, K., Soundy, M. & Wilson, C. The effect of MCPB on the yield and maturity of vining and picking peas.* (*pp. 515–21*).
Of the twelve varieties tested eight were highly resistant even to high dosages of the above herbicide. Gregory's Surprise was highly susceptible at all rates of application and Kelvedon Wonder also showed considerable yield reduction.

222 *Hirst, R. H., Martin, D. L., Gathergood, A. L. & Upton, R. A. Weed control in peas with dinoseb and phenoxybutyric acid derivatives.* (*pp. 523–31*).
Yield reduction and delayed maturity have been observed at Fenhurst in both Gregory's Surprise and Thomas Laxton sprayed with MCPB and 2,4-DB.

223 *Luckwill, L. C. & Campbell, A. I. The tolerance of fruit crops to certain selective and pre-emergence herbicides.* (*pp. 539–44*).
Cox's Orange Pippin apple was found at Long Ashton, Bristol, to possess considerable resistance to 2,4-D and 4-CPB while Cheddar Cross was severely damaged.

## CEREALS

224 BROWN, C. M. & WEIBEL, R. O.
**Border effects in winter wheat and spring oat tests.**
Agron. J. 1957 : **49** : 382–84.
In three tests on 28 varieties of wheat and in one test on 40 varieties of oats in Illinois, a 2-foot border between plots each consisting of 4 rows 10 ft. long and 1 ft. apart resulted in a highly significant border effect upon grain yield, the border rows being higher in yield. In the test on oats and in one test on wheat, a significant border x variety interaction for yield was found. No border effect with respect to test weight was detected in wheat. In oats the test weight was lower in the border rows.

225 Bericht über die Tätigkeit der Forschungsanstalt für Landwirtschaft, Braunschweig-Völkenrode im Jahre 1956. (**Report on the activity of the Agricultural Research Institute, Braunschweig-Völkenrode in 1956**).
1957 : Pp. 76.
A number of cereal varieties have been tested for suitability for combine harvesting and others have been tested for winter hardiness in the coleoptile stage.

226 MÜLLER, K.-H.
Die Getreidesortenversuche 1955 unter Berücksichtigung mehrjähriger Ergebnisse. (**The 1955 cereal variety tests with relation to the results of several years**).
Z. landw. Vers.- UntersuchWes. 1956 : **2** : 295–316.
The results of 243 tests carried out in seven representative zones of the German Democratic Republic in 1955 are considered together with the results for 1951–54. The varieties tested are described briefly, their origin is given and their behaviour discussed. The following varieties gave the best yields over the entire period: Rekord winter barley, Hadmersleben VIII winter wheat, Peko spring wheat, Elsa and Freya spring barley and Flämingsgold, Flämingstreue, Goldhafer II [Gold oat II], Holdi, Bärdeweiss and Omeko oats.

227 **The examination of wheat, barley and oats for the Descriptive List of Varieties of Field Crops.**
Windmill, The Hague 1957 : No. 22 : 6–8. Also in French, 8–10; German, 10–11; Spanish, 11–13 and Italian, p. 13.

Methods of appraising cereal varieties for their eligibility for inclusion in the above Dutch list are outlined.

228 **(Synopsis of the 1956 Japanese Cereal Investigations Conference. Results of investigations in 1955).**
Ikushugaku Zasshi/Jap. J. Breeding 1957 : **6** : p. 272. [Japanese].

An outline is given of Japanese breeding projects involving wheat and barley, of new strains released and of research stations where work is being done.

229 SMIRNOV, A. N.
**(New varieties of wheat, oats and barley in Canada).**
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1957 : No. 7 : 140–44. [Russian].

Breeding work on cereals in Canada is discussed with special reference to disease resistance, and some recently bred varieties are described.

230 **Small grain varieties for Indiana. Recommendations for 1957 and performance 1950-1956.**
Sta. Bull. Ind. agric. Exp. Sta. 1957 : No. 646 : Pp. 20.

The results of variety trials carried out on wheat, oats, rye and barley during 1950–56 in Indiana are summarized; descriptive notes are given on recommended varieties. One new variety released is a stiff-strawed, medium-short and early spring oat named Putnam.

231 ROSS, W. M. & MILLER, J. D.
**Cereal Crops.**
Circ. Kans. agric. Exp. Sta. 1956 : No. 345 : 4–13.

**Wheat.** Bison has been released and is expected to do well in Kansas.

**Barley.** Breeding for improved winter hardiness has continued. Tabulated agronomic data on four winter and three spring varieties are included.

**Sorghum.** Chemical analyses have been carried out of grain and forage sorghum. Details are given of the protein, starch and crude fat percentages of the grain of eight varieties and seven hybrids, all having Day as one of their parents and of the percentage of fat, protein, ash, fibre, nitrogen-free extract, sucrose, glucose, sugar in the juice and total sugar of the stalks of seven forage varieties and seven hybrids all involving Combine Kafir 60. Improved lines have been selected from crosses between American commercial varieties and an African sorghum with yellow endosperm and a relatively high carotene content. The carotene level of the best selections is three times that of Midland but less than 30% that of yellow maize.

232 DOGONADZE, R.
**(Cereal crops in Albania).**
Zemledelie (Agriculture) 1957 : No. 3 : 74–78. [Russian].

Mention is made of Albanian land varieties of wheat, oats, maize, barley and other crop plants, mainly interesting for their early maturity. Among them are the hard wheat Mavrogan, which is sown as a winter crop and shows resistance to lodging and shattering, and the oat variety Pugliese, notable for hardiness, and resistance to drought and water-logged soils.

233 THORPE, H. C. & DIXON, G. E.
**Release of new cereal varieties—1957.**
E. Afr. agric. J. 1957 : **22** : 183–85.

The following cereal varieties have been released by the Kenya Department of Agriculture:—

**Wheat** (1) Three selections from 184P2A1E x 294B2A3, namely 368AC4A, a bearded, white-grained strain, 358R7E, bearded and red-grained and 358P7C, beardless and red-grained. Developed at the Plant Breeding Station, Njoro, Kenya, all three are white-chaffed, of moderate straw strength and midseason maturity and are suited to areas from 6500 to 8000 ft.

(2). 363K133, from the cross Warigo x 261S10C2D, also made at Njoro, is bearded, white-chaffed, white-grained, of midseason maturity and with fairly strong straw. It is recommended for areas from 7000 to 8000 ft. where it should remain free from stem rust, which attacks it at lower levels, and yellow rust which occurs at higher levels.

(3). Two beardless, red-grained selections from Equator x 294M7C6C, developed at Molo. 362B1A1B is white-chaffed, of midseason maturity and with fairly short straw, while 362B1D3D is red-chaffed, later in maturity and has taller and weaker straw. They are adapted to areas above 8000 ft. The latter variety has better stem rust resistance than Equator.

(4). Single-plant selections from 1066, namely 1066/1 and 1066/6, both of which resemble the parent variety but have stronger straw and give slightly higher yields.

(5). Four imported varieties, Mida Cadet from Canada, Capella from Italy and Hopeful and Impala from South Africa.

234 MODYLEVS'KYJ, JA. S.
**[Use of cytoembryonic data for investigating the phasic development of plants. (Cytoembryological analysis of phasic development of cereals)].**
Ukrajin. bot. Ž. 1956 : **13** : 41–53. [Russian].

Some 6–7 days after fertilization, wall formation begins in the endosperm of cereal grains, the growing points are laid down in the embryo and the primordia of the floral organs seem to be initiated. These changes are thought to constitute a third stage in phasic development corresponding to the vernalization and light stages.

235 ROMMEL, M. & JENKINS, B. C.
**Autopolyploids and amphipolyploids in *Triticinae* produced at the University of Manitoba to March 1957.**
Wheat Inform. Serv. Kyoto 1957 : No. **5** : p. 20.

A list is given of newly developed autopolyploids and amphidiploids in species and hybrids of *Aegilops, Secale, Agropyron* and *Triticum.*

236 SĂLĂGEANU, N. & TAŞCĂ, C.
Despre mersul transpiraţiei în decursul zilei şi al perioadei de vegetaţie şi despre coeficientul economic al transpiraţiei la unele cereale. Nota III. **(On the course of transpiration throughout the day and during the vegetative period and on the economic coefficient of transpiration of some cereals. Note III).**
Bul. şti. : Secţ. Biol. Şti. agric. : Ser. Bot. 1957 : **9** : 141–55.

Information is provided on diurnal and seasonal variations in transpiration rate and on the economic coefficient of transpiration (transpiration rate/organic matter accumulated) of a series of Rumanian wheat, oat and barley varieties [cf. XXVI, 3134].

237 MANNER, R.
**The occurrence of plants with only one seminal root in rye and wheat and its consequence.**
Acta agric. Scand. 1957 : **7** : 260–74.

Winter wheat, spring wheat and winter rye plants with only one seminal root developing during the first ten days after germination showed a lower rate of survival, developed fewer adventitious roots and ears, yielded less grain and had a slightly higher 1000-grain weight than those with more than one seminal root. In winter rye and spring wheat further studies revealed a highly significant positive correlation between the number of adventitious roots on the one hand and number of flowering culms, number of kernels and weight of grain per plant, on the other.

238 BAUMANN, H. & KLATT, F.
Beregnungszeitpunktversuche mit Hafer- und Winterweizensorten. **(Experiments to find the time for irrigating varieties of oat and winter wheat).**
Z. Acker- u. PflBau. 1957 : **103** : 380–96.

Marked varietal differences in the response to irrigation were found. Of the five oat varieties tested, Flämingsgold and Bördeweiss showed the greatest increase in yield. Hadmerslebener I and II gave increased yields of grain but not of straw; with Derenburger Silber [Derenburg Silver] and Bastard II [Hybrid II] the yield of straw showed a higher increase than the yield of grain. Langensteiner Braun [Langenstein Brown] did not give a satisfactory response to irrigation.

239 SAKAI, K.-I.
**Studies on competition in plants. VII. Effect on competition of a varying number of competing and non-competing individuals.**
J. Genet. 1957 : **55** : 227–34.

This paper is the full report of experiments previously summarized [XXVII, 1245 and 3832].

240 BELL, G. D. H. & WHITEHOUSE, R. N. H.
**Winter hardiness and frost resistance in cereals.**
Agric. Rev. 1957 : **3** : 10–14.

Resistance to winter conditions in varieties of wheat, barley and oats is discussed with reference to such conditions in Great Britain; possible long-term methods of breeding for hardiness are outlined.

241 COMPTON, L. E.
**Lodging by node-bending in wheat and barley.**
Agron. J. 1957 : **49** : 518–19.

Analysis at Lafayette, Ind., of advanced lines from crosses between varieties of wheat susceptible to the above type of lodging indicates that susceptibility is genetically controlled. A tendency toward node bending was observed in widely unrelated material but in all cases it was also influenced by environmental conditions. A similar type of lodging has been observed among winter barley lines.

242 Johnson, T.
**Plant disease control in western Canada, with particular reference to small grains.**
Z. PflKrankh. 1957 : **64** : 625–31.

This survey includes a section on some results attained in breeding cereals and linseed for disease resistance during the past forty years.

243 Parmentier, G.
Techniques d'études des races physiologiques d'*Erysiphe graminis* (DC.). [**Methods for the study of physiological races of *E. graminis* (DC.)**].
Parasitica 1956 : **12** : 117–24.

Emphasis is laid on the importance of standardization of the conditions of experiment when testing the reactions of cereal varieties to physiological races of *E. graminis* and recommendations for improved techniques are made.

244 Turner, E. M.
**The effect of some amino acids on the growth of two varieties of *Ophiobolus graminis*.**
J. gen. Microbiol. 1957 : **16** : 531–33.

It has been found at Oxford, England, that *O. graminis* and *O. graminis* var. *avenae* differ in their reaction to cystine and cysteine, the former growing as well with these as it does with hydrolysed casein while growth of the latter variety is inhibited. It is suggested that the physiological difference indicated by these results may be connected with the difference in pathogenicity of the two varieties.

245 Gustavsson, A.
Fysiologiska raser av stråsädesrost i Sverige 1956. (**Physiological races of cereal rusts in Sweden, 1956**).
Bot. Notiser 1957 : **110** : 293–306.

The following rusts have been identified in Sweden: wheat stem-rust races 21, 34 and three tentatively identified as 11, 17 and 133, the first two being predominant; leaf-rust races 77 and 20 and two others; oat stem-rust races 3, 4, 6 and 7; and about 15 races of crown rust of oats, of which the most common were 228 and 231. Samples of stripe rust of wheat have also been obtained but have not been identified.

246 Gustavsson, A.
Rasinventering av stråsädesrost. (**Taking stock of cereal rust races**).
Växtskyddsnotiser 1957 : **21** : 39–41.

Tests carried out in Sweden, mainly on samples from Götaland, showed the following races to be present: on wheat the most common black rust races were 21 and 34, three other races also being found while the most prevalent brown rust was race 77. On oats, black rust races 3, 4, 6 and 7 occurred and about 15 crown-rust races were found, of which 228 and 231 were the most frequent; one crown rust race was capable of attacking all ten differentials. [Cf. 245].

247 Broyles, J. W.
**Comparative studies of races and biotypes of *Puccinia graminis*, with special reference to morphology of urediospore germination, chemical composition, and factors affecting survival.**
Diss. Abstr. 1957 : **17** : Publ. No. 20,547 : 954–55. (Abst.).

Indications have been found of inherent differences between biotypes of *P. graminis* var. *tritici* and *P. graminis* var. *avenae* in respect of several cultural characteristics of their uredospore germ tubes. Chemical analysis of germ tubes of the two above varieties and of *P. coronata* var. *avenae* have shown small but consistent biochemical differences. The host variety on which spores were produced was found to affect the free aminoacid present in the spores. Differences were also observed between the survival percentages of biotypes of *P. graminis* var. *tritici* on Little Club wheat while comparisons of infectivity of five biotypes on 13 wheat varieties showed large differences between biotypes on the same variety, between varieties infected with the same biotype and also showed interactions between biotypes and varieties. Biotypes of the same race differed as much as biotypes of different races for most of the characters studied.

## WHEAT

248 Nanda, K. K. & Chinoy, J. J.
**Analysis of factors determining yield in crop plants. I. Varietal differences in yield of grain and straw of wheat as influenced by photoperiodic treatments.**
Plant Physiol. 1957 : **32** : 157–62.

The effects of various combinations of photoperiodic treatments during and after the seedling stage upon grain and straw yields in *Triticum vulgare* 'NP165', 'NP52' and 'PC591' were investigated. NP165 is the earliest to flower and PC591 the latest. Irrespective of seedling treatments, grain and straw yields and grain : straw ratios were reduced by both short days (6 hr.) and long days (illumination for 18 hr. or continuous) applied after transplantation of the seedlings. Reductions after short-day treatment were directly due to a low rate of assimilation; those after long days appeared to be the indirect result of light on the production of growth regulators. The various effects of seedling treatments were subordinate to those of treatments given after the seedling stage. Duration of the vegetative period was related to response to photoperiodic treatment during or after the seedling stage; the later the variety in flowering the greater the beneficial effect of long-day treatment of the seedlings and the lower the reduction in yield resulting from long or short days after the seedling stage. Attention is drawn to the possible role of the adverse influence of higher temperature during the ripening period into which the plants may be shifted by short-day treatment.

249 NANDA, K. K. & CHINOY, J. J.
**Analysis of factors determining yield in crop plants. II. The influence of photoperiodic treatments on characters determining yield in wheat with special reference to the temperature of the ripening period.**
Plant Physiol. 1957 : **32** : 163–69.

In further experiments on NP165, NP52 and PC591 [cf. 248] number of ears per plant, ear length, number of spikelets and grains per ear and 1000-grain weight were reduced by treatment with short or long days after transplantation. The various effects of seedling treatments were less pronounced. With respect to these characters, the interactions of variety with seedling treatment and treatment after the seedling stage were usually significant. Grain yield and temperature of the ripening period were not related. This masking of the effect of temperature is ascribed to the influence of long and short days upon tiller number and plant height and also upon pollen fertility.

250 SJUJ, JU.-T. [SHUI, Y.-T.]
**(The conditions at vernalization of winter wheat and their effect upon the progeny).**
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1957 : No. 1 : 13–19. [Russian].

The hereditary constitution of Kooperatorka was shattered by vernalization first at — 3° C. and then at temperatures above zero. The progeny behaved like spring wheats.

251 PAL, B. P., SWAMINATHAN, M. S. & NATARAJAN, A. T.
**Awning induced in wheat by treatment with radioactive phosphorus.**
Wheat Inform. Serv. Kyoto 1957 : No. 5 : 4–5.

Some plants of NP809 treated at the Indian Agricultural Research Institute with $P^{32}$ in the flag-leaf stage gave progeny with fully bearded or partly bearded heads and it is presumed that in such plants the dominant awn inhibitors $B_1$ or $B_2$ have been deleted or altered. A lower frequency of awn mutation was observed in plants receiving the largest dose but these plants also showed 54% pollen sterility and reduced seed setting, suggesting that more drastic cytological changes resulting in the abortion of aberrant gametes had been caused.

252 UKOLOV, A. A.
**(Qualities of the winter-wheat variety Moscow 2453).**
Izv. Timirjazev. seljskohozjajstv. Akad. (News Timirjazev agric. Acad.) 1957 : No. 1 : 61–68. [Russian].

The variety in question, produced by the Timirjazev Academy in 1929, has been surpassed in yielding ability by other varieties but data are presented to show that it is still superior in 1000-corn weight and winter hardiness. Other figures show that seed of the variety reproduced in different places may give yields which vary from 25·3 to 29·6 c. per ha.; differences were noted also in 1000-corn weight, protein content and rate of development of the ear primordia; these differences may be as great or greater than those in favour of the newer varieties which are superseding Moscow 2453. By combined selection the average yield of the variety in the Moscow region has been raised from 30·7 to 32·9 c. per ha. and improvements have also been effected in the 1000-corn weight and protein content, the latter having risen from 21·55% to 22·30%. When this improved selection was tested in 10 different places it gave higher yields in 8 of them, the differences varying from 0·5 to 6·5 c. per ha.; in two places it yielded 1·2 and 3·1 c. less.

253 MIKKELSEN, K.
Sortforsøk med høsthvete (og sammenlikning med høstrug) på sør-østlandet i perioden 1949/50–1954/55. **[Variety trials of winter wheat (and comparison with winter rye) in south-eastern Norway during the period 1949/50-1954/55].**
Forskn. Fors. Landbr. 1957 : **8** : 113–24.

In the above trials, involving 23 winter wheats, the Weibull line W11783 gave the highest yields but was surpassed by commercial varieties in stiffness of straw and winter hardiness.

254 Wintertarwe, 1957. **(Winter wheat, 1957).**
Landbouwvoorlichting 14 : Bijl. 15 : Ber. Rassenkeuze 1957 : No. 232 : Pp. 5.

Information is given on the grain yields of 23 varieties tested on different soil types in the Netherlands, together with a brief description of each variety. Seven of the varieties had not been included in the official varietal list at the time of testing but of these the three wheats CB 50/49, CB 50/35 and Lang-Doerfler GB 101 have now been recognized.

**Fourteenth Annual Report on Winter Wheat Improvement in Ontario. 1956 crop.** 1957 : Pp. 22.

255 *Waddell, W. H. Winter wheat improvement at the Ontario Agricultural College. (pp. 1–3).*

Some new hybrids have been compared in field trials with the standard varieties Genesee and Seneca. All the hybrids showed good leaf rust resistance and several of them were promising with respect to loose-smut resistance, straw strength and yield.

256 *Whiteside, A. G. O. & Edgar, J. Winter wheat improvement work at Central Experimental Farm, Ottawa. (pp. 3–5).*

A series of varieties and hybrids were tested for resistance to dwarf bunt. Those which were free of infection in 1956 are listed. Resistance in Martin appears to be controlled by a single gene. Breeding for dwarf bunt resistance has continued with hybrid lines from the cross 4719 (Rex-Oro 12421 x Cor. 595) x Cor. 595. Lines resistant to smuts have been selected and some crosses made with Genesee and other varieties. *T. caries* '16' was found unreliable in final tests for dwarf-bunt resistance. Crosses have been made between Ontario varieties and dwarf-bunt resistant varieties from Pullman, Wash. Genesee has been widely used in these crosses as the high-yielding loose-smut resistant parent. Selection for bunt and loose-smut resistance is taking place.

257 *Clark, G. H. Winter wheat improvement work at the Experimental Farm, Harrow, 1956. (pp. 6–7).*

Twenty-five varieties were investigated in the rust-resistance test. 4708–4 was found very resistant to leaf rust and gave a higher yield than Genesee. In another test, Genesee and the Ottawa line 3909C gave high yields. Lines 4325H and 3909C were more resistant to leaf rust than Genesee, Seneca and Cornell 595.

258 *Hybrid G.C. 361. (pp. 10–11).*

Attempts are being made to produce pure lines of red and white segregates of GC361 (Caldwell 10 x Dawsons). Data on agronomic characters and quality are given for GC361 and three other varieties.

259 *The Co-operative winter wheat test. (pp. 16–22).*

The cooperative test was made on 13 varieties and hybrids sown at six stations. Genesee was found to give the highest yield. Three hybrids, 4325H, GC361 and 3914A, were completely resistant to loose smut and several hybrids showed high resistance to leaf rust. GC361 was the highest in protein of three red wheat varieties tested.

260 Copp, L. G. L.
**Bulk and pedigree methods in wheat breeding.**
Wheat Inform. Serv. Kyoto 1957 : No. 5 : 7–9.

The above methods of breeding are described and compared. The results of 26 years' work in New Zealand in which the two methods have been carried out simultaneously have shown that the pedigree method is to be preferred under conditions where disease is not a limiting factor.

261 Walkden Brown, C.
**Limitations of Early Blackhull.**
Agric. Gaz. NSW 1957 : **68** : 261–62.

The Department of Agriculture is producing an improved winter wheat possessing good grain quality and good grazing value. This should replace Early Blackhull which is only recommended for green grazing.

262 Pearson, F. B.
**Wheat varieties.**
J. Dep. Agric. S. Aust. 1957 : **60** : 484–88, 502.

A description is given of 34 varieties which were grown in Southern Australia in 1955–6. Agronomic and quality characters are mentioned.

263 Kuspira, J. & Unrau, J.
**Genetic analyses of certain characters in common wheat using whole chromosome substitution lines.**
Canad. J. Plant Sci. 1957 : **37** : 300–26.

Each genotype of the substitution lines made differed from the recipient Chinese Spring with respect to one chromosome obtained from Thatcher, Hope or Timstein. Genes conditioning awning were associated with seven chromosomes. The time of heading was conditioned by major genes differentiating between spring and winter growth and by other modifying genes. Minor genes conditioned spike density and plant height. Multiple genes on many chromosomes had small unequal effects on lodging, protein content, 1000-kernel weight and yield. It is suggested that the substitution method is of value for incorporating characters controlled by one or two genes into a given line. A method is outlined for determining the number of genes on a substituted chromosome which produces significant character differences from the recipient variety.

264 Everson, E. H., Muir, C. E. & Vogel, O. A.
**Dwarfing in *Triticum vulgare* (Vill.).**
Agron. J. 1957 : **49** : p. 521.

During a study of the inheritance of differences in plant height at Pullman, Wash., numerous dwarf plants were found among the progeny of (Norin 10 [Ministry of Agriculture and Forestry 10] x Brevor-14) x Burt. The data provided confirm the hypothesis that the parent plants differed by two genes, one, designated *I*, for normal height, which inhibits the second, *D*, for dwarf habit. A sister selection, Norin 10 x Brevor-1978, when crossed with Burt gave all dwarf $F_1$ progeny. The following genotypes are suggested for the lines involved: Burt *DDIIee*; Norin 10 x Brevor-14 *ddiiee* and Norin 10 x Brevor-1978 *ddiiEE*.

265 **World catalogue of genetic stocks. Wheat.**
FAO UN, Rome 1957 : Suppl. No. 6 : Pp. 13. (Mimeographed).

This supplement contains contributions from Belgium, France, Iran, Italy, Sweden and the USA [cf. XXVI, 3148].

266 Hermsen, T. G. T.
Semi-lethaliteit in kruisingsnakomelingschappen van tarwe. **(Semilethality in hybrid progenies of wheat).**
StudKring. PlantVeredel., Wageningen Versl. 1956 : **51** : 696–97. (Mimeographed).

An account of the work referred to earlier [XXVII, 2761 and 3899] is presented.

267 Yamashita, K.
**Linkage analysis by RT-method.**
Wheat Inform. Serv. Kyoto 1957 : No. 5 : p. 3.

Gene locations for light green and yellow leaf X-ray-induced mutations of wheat on chromosomes g and d respectively have been established by the reciprocal translocation method at Kyoto, Japan.

268 Maliani, C.
La mejora genética de los trigos duros. **(The genetic improvement of hard wheats).**
Agricultura, Madr. 1957 : **26** : 386–88.

Reference is made to the wheat Roberto Forlani, obtained by crossing the bread wheat Villa Glori with a 14-chromosome wheat [cf. XXVI, 3166], and to further experiments in which R. Forlani was crossed with a series of other hard wheats; all crosses gave good sets and a high degree of fertility in the $F_1$ hybrids. In the $F_2$ both soft and hard wheats emerged and many of them combine desirable characters from both species. In spite of this ease of crossing with hard wheats the chromosome number $n = 21$ has been confirmed for R. Forlani.

269 Okamoto, M.
**Identification of the chromosomes of the A and B genomes.**
Wheat Inform. Serv. Kyoto 1957 : No. 5 : p. 7.

Results so far obtained from a study of crosses between plants carrying one or two telocentric chromosomes involving the A and B genomes and AADD plants from *Triticum aegilopoides* x *Aegilops squarrosa* indicate that chromosomes V, VI, IX and XI belong to genome A and I, VII and VIII to genome B.

270 Okamoto, M.
**Asynaptic effect of chromosome V.**
Wheat Inform. Serv. Kyoto 1957 : No. 5 : p. 6.

Studies of the $F_1$ progeny from crosses between plants which were monosomic for a telocentric chromosome V and AADD plants from *Triticum aegilopoides* x *Aegilops squarrosa* showed that pairing in 34-chromosome plants without the telocentric was unexpectedly more frequent than in 35-chromosome plants. It is tentatively suggested that the telocentric V carries a gene or genes for asynapsis although the asynaptic effect has so far only been observed in this hybrid.

271 Sadanaga, K.
**Cytological studies of hybrids involving *Triticum durum* and *Secale cereale*.**
Iowa St. Coll. J. Sci. 1957 : **31** : p. 515. (Abst.).

Hybrids were obtained between *Triticale* (*T. durum* 'Carleton' x *Secale cereale*) and the durum varieties Iumillo, FPI94587 and Stewart and spring rye. Hybrids of *Triticale* with FPI94587 and Stewart had the hairy neck character conditioned by genes on chromosome I of rye while nonhairy neck hybrids with $2n = 31$ or 32 were obtained from the cross with Iumillo. Two hybrids with and four without the hairy neck character were obtained from the cross with spring rye. Cytological studies showed that in the crosses of *Triticale* with *T. durum* the number of bivalents in the pollen mother cells varied from 11 to 14 and the high frequency of cells with 14 bivalents is taken to indicate that these hybrids originated from the fertilization of a *Triticale* egg cell of ABS–3 or ABS–4 constitution by a gamete carrying the AB wheat genome. Quadrivalents were observed in all crosses with *T. durum*, the percentage in hybrids involving Iumillo ranging from 19·0 to 37·1%. No quadrivalents were observed in hybrids with rye and it is concluded that the segregation into ring-forming and normal plants in the back-cross and self progenies of the hybrids with wheat is probably due to a reciprocal translocation between wheat chromosomes, the interchange originating in *Triticale*. In hybrids involving rye the number of bivalents at metaphase I was most commonly five in the nonhairy neck plants, which had $2n = 25$ or 26. The hairy-neck plants which were otherwise phenotypically similar had $2n = 27$, one frequently having three bivalents at metaphase I and the other five. In the latter plant approximately 38% of the pollen mother cells contained trivalents. A 29-chromosome plant monosomic for chromosome I of rye was derived from a back cross of *Triticale* x FPI94587 to Khapli. The presence of the rye chromosome adversely affected plant height and increased the frequency of asynapsis of one or two pairs of wheat chromosomes. Approximately 83% of the self and back-cross progenies of the hybrids involving *T. durum* had $2n = 28$ or 29. This is taken to indicate that gametes containing the AB genome or the AB genome plus one rye chromosome were more effective in fertilization than gametes with AB plus two or more rye chromosomes.

272 Nakajima, G.
**(Cytogenetical studies on F$_2$ plants of *Triticum Timopheevi* x *Secale africanum*).**
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1955 : **68** : 160–63. [Japanese].

Two segregates, markedly dissimilar morphologically, are described. The respective modal meiotic configurations were $9_{\mathrm{II}} + 21_{\mathrm{I}}$ and $6_{\mathrm{II}} + 13_{\mathrm{I}}$. Both plants were sterile [cf. XXVII, 2772].

273 Nakajima, G.
**(A cytogenetical study of F$_1$ plants of *Triticum pyramidale* x *Secale africanum*).**
Ikushugaku Zasshi/Jap. J. Breeding 1957 : **6** : 228–32. [Japanese].

The hybrids were intermediate, morphologically, between the parental species. The chromosome number was $2n = 21$ and the modal meiotic configuration $21_{\mathrm{I}}$; up to three bivalents were noted. Numerous F$_2$ plants were obtained by selfing.

274 Sánchez-Monge, E.
**Polyhaploids of *Triticale*.**
Wheat Inform. Serv. Kyoto 1957 : No. 5 : 18–19.

Out of 14 families from colchicine-treated F$_1$ plants from crosses between wheat and rye, made at Zaragoza, Spain, 13 had $2n = 56$. In the remaining family five plants had $2n = 56$, one $2n = 40$ and three $2n = 28$ and it is concluded that the last group are polyhaploids with 21 chromosomes from *Triticum aestivum* and 7 from *Secale cereale*.

275 Nakajima, G.
**(A plant obtained from F$_1$ TdicSa by treatment with *Haynaldia*).**
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1956 : **69** : 236–38. [Japanese].

A 20-chromosome offspring of F$_1$ (*Triticum dicoccum* x *Secale africanum*) was obtained after applying the pollen of *Haynaldia villosa*. The 20-chromosome plant resembled its mother plant morphologically and the modal bivalent frequency of each was $0_{\mathrm{II}}$. It is concluded that the 20-chromosome plant arose parthenogenetically.

276 Jenkins, B. C.
**The addition of an *Agropyron* genome to the common wheat variety Chinese Spring.**
Wheat Inform. Serv. Kyoto 1957 : No. 5 : p. 14.

Most plants from lines from the cross Chinese x (Chinese x *Agropyron elongatum*), now in at least the F$_{15}$ generation, have $2n = 56$ and in crosses with common wheat the most frequent chromosome configuration is $21_{\mathrm{II}} + 7_{\mathrm{I}}$, indicating that a genome from *Agropyron* has been added to wheat.

277 Elliott, F. C.
**X-ray induced translocation of *Agropyron* stem rust resistance to common wheat.**
J. Hered. 1957 : **48** : 77–81.

A stem-rust resistant derivative ($2n = 56$) of $6n$ wheat x *A. elongatum* ($2n = 70$) was crossed as ♀ to the susceptible $6n$ wheat Idaed at the Washington Agricultural Experiment Station. The F$_1$ seeds were then X irradiated. Screening for stem-rust reaction at the Dominion Cereal Breeding Laboratory, Winnipeg, Man., resulted in the discovery of one resistant wheat-like X$_2$

plant. The $X_3$–$X_5$ progenies of this individual maintained their resistance and showed no marked segregation for morphological characters, the chromosome number being fairly well stabilized as $2n = 42$. The resistant stock (SH198–4) is differentiated from Idaed by at least three interchanges. Rearrangements in the wheat used in the cross with *A. elongatum* may however also have occurred. Unlike its parents, SH198–4 has the dominant character of red glumes, possibly as the result of a position effect or because the translocations were accompanied by deletion of suppressors, inhibitors or modifiers. At Winnipeg the stock has shown a high degree of resistance to stem rust, including biotypes of race 15B; it should prove useful in breeding. It is susceptible to leaf rust and unsatisfactory in milling and baking quality.

278 ELLIOTT, F. C.
**Induced translocations in wheat.**
Wheat Inform. Serv. Kyoto 1957 : No. 5 : p. 4.

Further studies [cf. XXVII, 383] at Pullman, Wash., have shown no obvious segregation for morphological characters nor appreciable differences in metaphase I associations between or within $X_3$, $X_4$ and $X_5$ generations of rust-resistant wheat x *Agropyron elongatum* progeny. Nearly all plants had $2n = 42$. Cytological studies of $F_1$ progeny from a cross between the rust-resistant stock and Idaed showed that at least three interchanges were involved in differentiating the caryotypes of the parents. Some progress has been made in the transfer of bunt resistance from an octoploid involving *A. elongatum* to *Triticum compactum* 'Elgin'. Crosses have been made between *A. elongatum* x common wheat on the one hand and (*T. timopheevi* x *T. orientale*)$^2$, (*T. timopheevi* x *T. polonicum*)$^2$, (*T. timopheevi* x *T. durum* 'Carleton')$^2$ and (*A. tricophorum* x *T. durum* 'Pentad')$^2$ on the other.

279 LESIK, F. L.
**(Experimental synthesis of the amphidiploid between soft and hard wheat).**
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1948 : **60** : 145–47. [Russian].

The following amphidiploids were obtained: *Triticum vulgare* x *T. durum* ($2n = 70$); *T. vulgare* x *T. turgidum* ($2n = 70$); *T. vulgare* x *T. persicum* ($2n = 70$); *T. durum* x *T. dicoccum*, *T. durum* x *T. turgidum* and *T. durum* x *T. persicum* ($2n = 56$). They were obtained by keeping pollinated ears in a thermostat at 40–45° C for 40–60 minutes or by submerging hybrid grains in a 0·0125% colchicine solution. The percentages of amphidiploid plants of *T. vulgare* x *T. durum* obtained by the thermal and colchicine treatments were 0·1% and 0·3% respectively, fertility in the $F_1$ being generally high. Cytological and morphological descriptions of the $F_1$ amphidiploid are given. Meiosis in the case of the amphidiploid obtained by the thermal method was normal except for lagging of 1–2 chromosomes at anaphase. The $F_2$ was not as uniform as had been expected and comprised four distinct types of plants differing with regard to ear and grain characteristics, productiveness and maturation period. The $F_2$ productive midseason type with red awned ears and red vitreous grain bred true in the $F_3$, $F_4$ and $F_5$. This amphidiploid outyielded the wheat standard of the province of Vitebsk by 5–10% and equalled Lutescens 062 in yield in the province of Dnepropetrovsk.

280 RILEY, R. & CHAPMAN, V.
**The comparison of wheat-rye and wheat-*Aegilops* amphidiploids.**
J. agric. Sci. 1957 : **49** : 246–50.

In investigations at the Cambridge Plant Breeding Institute, England, *Secale cereale* 'King II' proved to be almost completely self incompatible, in contrast to *Ae. longissima* ($2n = 14$) and *Ae. caudata* ($2n = 14$), which were both self compatible. *Ae. longissima* may be regarded as predominantly inbreeding while *Ae. caudata* is probably often out-pollinated. The 28-chromosome hybrids of *Triticum vulgare* 'Holdfast' with these two species of *Aegilops* and the above rye were treated with colchicine in order to obtain 56-chromosome amphidiploids. Cells with univalents were observed in all three amphidiploids, the frequency of univalents being higher in the two wheat-*Aegilops* amphidiploids than in the *Triticale*, and higher in $8x$ wheat x *Ae. caudata* than in $8x$ wheat x *Ae. longissima*. Frequency of univalents therefore bore no relationship with the breeding system of the $2x$ parent. The fertility of $8x$ wheat x *Ae. longissima* was more than twice that of $8x$ wheat x *Ae. caudata* and four times that of the *Triticale*. Sterility was thus not associated with univalent frequency. It is suggested that the lower fertility of the *Triticale* may have resulted from interactions between genotypes adapted to different breeding systems rather than from homozygosity of deleterious recessive genes derived from the outbreeding rye parent. Independence of meiotic regularity and fertility raises problems in selecting $8x$ amphidiploids.

281 Pisarev, V. E.
**(Using polyploidy in plant breeding).**
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1957 : No. 3 : 23–32. [Russian].

Mention is made of the writer's own research at Nemčinovka, where a number of amphidiploids of spring wheat and spring rye, in particular AD20, AD41 and AD61, were developed. These are characterized by high yield, high protein and gluten contents and resistance to *Ustilago*, *Puccinia* and *Erysiphe*. In recent years AD20 was crossed with such wheats as Moscow and Marquis and new forms of wheat with good baking quality and high protein and gluten contents were obtained. Some hybrids outyield the standard Moscow; the yield of others is being improved by selection. A reference is made to amphidiploids of *Triticum* x *Agropyron*, which have 84 chromosomes. Some hybrids between these amphidiploids and wheat proved highly productive of grain in 1956 at Nemčinovka and had a protein content of the order of 16%.

282 Jenkins, B. C. & Mochizuki, A.
**A new amphidiploid from a cross between *Triticum durum* and *Agropyron elongatum* ($2n = 14$).**
Wheat Inform. Serv. Kyoto 1957 : No. 5 : p. 15.

Cytological studies of four plants from the above cross indicated that pollen grains with 21 chromosomes were being produced by non-reduction and thus natural doubling was taking place, resulting in the formation of a new hexaploid. An average of 2·6 bivalents were formed at metaphase I in $F_1$ plants and unreduced pollen mother cells were observed. The majority of the progeny from these plants had $2n = 42$ but in back crosses with *T. durum* plants with 35 and 34 chromosomes were obtained. Plants showing fairly regular pairing of 21 bivalents have been selected to maintain the new amphidiploid.

283 Taran, A. V.
**(Vegetative rapprochement between graminaceous plants).**
Agrobiologija (Agrobiology) 1957 : No. 1 : 92–95. [Russian].

An improved method of grafting cereals and grasses developed at Dnepropetrovsk is described and the effects of vegetative rapprochement between spring and winter wheats upon habit and productiveness of the ears in the graft generation are discussed.

284 Skvorcov, S. N.
**(The utilization of intravarietal crossing in different varieties).**
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1957 : No. 1 : 19–26. [Russian].

Experiments on intravarietal crossing of wheat at various Soviet institutes are surveyed and reasons why in one case a variety may show improvements in yield and vigour with this treatment but not in another are analysed. Firstly it is shown that some varieties, in particular Ukrainka and Albidum 43, fail to respond to the treatment. Secondly, the method is useless in arid areas where high temperatures have a deleterious effect upon pollen viability. Instances where intercrossing plants of a variety raised from seed harvested in different years or in altered environments resulted in yield increases of up to 3·0 c. per ha. are mentioned. Among the varieties responding to the treatment were Lutescens 266, Ul’janovka and Erythrospermum 841.

285 Davydov, N. N.
**(A new promising variety of winter wheat, VIR-463).**
Bjull. vsesojuzn. Inst. Rasten. (Bull. All-Un. Inst. Pl.-Industr.) 1956 : No. 2 : 30–32. [Russian].

The variety described is derived from a cross of VIR–4 [Institute of Plant Industry 4] x Skorospelka 1 [Early 1]. It has short thick straw free from lodging, is resistant to yellow rust and fairly resistant to brown, and with an average yield of 35·2 c. per ha. over the last four years has outyielded Novoukrainka 83 by 25%; in 1956 it yielded 43·3 c. per ha. compared with 34·6 c. from Novoukrainka 83 and 37·8 from Bezostaja 4 [Awnless 4]. The new variety has large grains with baking quality above the average; its main defect is susceptibility to mildew.

286 Fajersson, F.
Vårt höstvetesortiment. **(Our winter wheat varieties).**
Weibulls Årsb. 1957 : 5–7.

In addition to notes on current varieties in southern and central Sweden, information on a number of promising lines still undergoing tests is presented. W14410, from a cross between a sister line of the southern variety Banco and a line from Eroica x Virtus, combines the high yield of Banco with the winter hardiness of Eroica. In central Sweden, the very early, stiff-strawed line W11548 (Eroica x Virtus) is winter hardy and has outyielded Odin by 5%. From W11548 another line, W12910, with even shorter, stronger straw has been selected.

287 IONESCU-SISEŞTI, G., MIHALCA, V. & BOLDEA, E.
Caracterele morfologice şi însuşirile fiziologice ale liniilor de grîu numărul 31 şi numărul 185, extrase din soiul A 15. **(The morphological characters and physiological attributes of the wheat lines No. 31 and No. 185, derived from variety A 15).**
Bul. şti. : Secţ. Şti. agric. Secţ. Geol. Geogr. 1956 : **8** : 799–807.

The above two Rumanian élite selections from A15 are described. Both exceed the parental form in yield and earliness.

288 PRIADCENCU, A., MELACRINOS, A., ENESCU, S. & BOLDEA, E.
**Macaroni wheat—local autumn variety.**
Rev. Biol., Bucureşti 1956 : **1** : No. **2** : 171–80.

The original Rumanian version of this article has been summarized already [XXVI, 3181].

289 **Kent wheat.**
Seed Scoop 1957 : **4** : No. **1** : p. 8.

The above named red winter wheat variety was produced at the Ontario Agricultural College, Guelph, Ont., from (Trumbull x Hope-Hussar) x Dawsons. It possesses moderate resistance to sprouting, stem rust and bunt and high resistance to leaf rust, loose smut and mildew. It is moderately high in protein and acceptable for pastry flour.

290 STOA, T. E.
**Wheat varieties—which choice for 1957?**
Bi-m. Bull. N. Dak. agric. Exp. Sta. 1957 : **19** : 75–79.

A number of varieties suitable for North Dakota are compared, mainly for yield and resistance to disease.

291 **Rego, Westmont, Itana wheat for Montana.**
What's New Crops Soils 1957 : **9** : No. **8** : p. 27.

The three wheat varieties mentioned here are all hard red winter wheats. Rego (Yogo x Rescue) is characterized by sawfly resistance and milling and baking qualities superior to Karmont. Westmont (Rio x Rex Nebred) and Itana (Blackhull x Rex Cheyenne) are both resistant to dwarf smut and are awned and brown chaffed. The milling and baking qualities of Westmont are similar to Comanche while those of Itana resemble Cheyenne. The first two varieties are being released in Montana, the last in Montana and Idaho.

292 SIMON, U.
Versuche zur Unterscheidung deutscher Weizensorten am ruhenden und keimenden Korn. **(Experiments on distinguishing German wheat varieties from resting and germinating grains).**
Z. Acker- u. PflBau. 1957 : **103** : 397–426.

Staining with phenols, estimating the time for germination and other tests, which were found reliable for distinguishing between varieties, are described. A key is provided for identifying the grain of some German varieties using these tests and morphological characters.

293 BHADURI, P. N. & NATARAJAN, A. T.
**The Punjab wheat C-591, a chromosomal mutation.**
Indian J. Genet. 1956 : **16** : 85–87.

Punjab C–591 has been found to differ from other hexaploid varieties in the possession of a double constricted region in the satellited portion of one pair of chromosomes. These SAT chromosomes showed normal segregation. The extra achromatic region does not organize a separate nucleolus.

294 NATARAJAN, A. T. & BHADURI, P. N.
**Studies on chromosomal biotypes in Khapli wheat.**
Indian J. Genet. 1956 : **16** : 77–84.

The morphological and cytological characters of a large population of two biotypes of *Triticum dicoccum* 'Khapli' were studied. Biotype I had two pairs of satellited chromosomes and Biotype II had one pair. The biotypes were found to differ significantly in length of ear, pollen size, pollen fertility and seed setting. The $F_1$ hybrid was intermediate for these characters and had three satellited chromosomes. In the $F_2$ the three types were found to segregate 1 : 2 : 1 with respect to the satellited chromosomes.

295 SUEOKA, N. & MUKAI, T.
**Studies on the right- and left-handedness of spikelets in Einkorn wheats. VII. The $\bar{C}$-value of the species of *Triticum* and *Aegilops*.**
Proc. Jap. Acad. 1956 : **32** : 191–96.

A table is included showing the genomes and $\bar{C}$-value [cf. XXVI, 2210–1] of 15 species and varieties of *Triticum* and 14 species and one hybrid of *Aegilops*. Only plants possessing A or D genomes had $\bar{C}$-values significantly higher an 50%, that for the A genome being 80% or ore and the D genome being about 65%. nce Emmer (AABB) and *T. timopheevi* (AAGG) ave C̄-values of about 50% it is suggested that e B and G genomes suppress the effect of enome A while Dinkel wheats (AABBDD) ave the same value as *Ae. squarrosa* (DD), ggesting the dominance of the D genome over ABB. The relationships of the *Triticum* and *egilops* genomes are discussed in the light of e investigation reported.

96 STAUDT, G.
**Some notes on autotetraploid *Triticum monococcum*.**
Wheat Inform. Serv. Kyoto 1957 : No. 5 : 1–2.

etraploid plants of *T. monococcum* var. *horne-anni* were produced at the Max Planck Insti- ute by colchicine treatment of germinating eeds. The tetraploids were darker green than ne diploids, had fewer tillers, shorter culms and ss dense spikes. They matured later and owed some reduction in fertility.

97 RILEY, R. & CHAPMAN, V.
**Haploids and polyhaploids in *Aegilops* and *Triticum*.**
Heredity 1957 : **11** : 195–207.

ytological investigations were carried out at he Cambridge Plant Breeding Institute, Eng- and, on (1) a haploid ($x = 7$) of *Ae. longissima*, 2) a polyhaploid ($2x = 14$) of *T. timopheevi*, (3) polyhaploid ($3x = 21$) of *T. vulgare*, (4) an neupolyhaploid of *T. vulgare* with the poly- aploid complement of *T. vulgare* plus one rye hromosome II, and (5) the hybrid ($3x = 21$) of *e. longissima* ($2n = 14$) x *T. timopheevi* ($2n =$ 8). In all forms some bivalents were formed ut the majority of chromosomes remained s univalents. Occasional trivalents were bserved, except in (1). Two main types of nivalent association were distinguishable: side- y-side (s–s) in which the chromosomes were arallel to each other and end-to-end (e–e) in which they lay in tandem. End-to-side associa- ions occurred infrequently. Mixed multiple ssociations combining s–s, e–e and end-to-side ssociations were observed very rarely. Members f s–s associations were segmentally homologous ut members of e–e associations were not. It is uggested that all types of univalent association were due to fusion between heterochromatic egments. Such fusion would maintain the arallel alignment of chromosomes which had aired homologously at prophase without chiasmata, and would thus result in s–s association. Chance fusion would lead to e–e and other associations. Univalents segregated to the poles at random except in (2). When the amount of pairing was considered relative to the chromosome number, (1) and (2) appeared to be about equal as regards structural equivalence within their haploid complements but both species had considerably less structural duplication than (3). Possibly in the course of evolution greater differentiation has been established between the two chromosome sets of the older tetraploid species *T. timopheevi* than between the third set and original two sets of the younger hexaploid species *T. vulgare*. The hybrid *Ae. longissima* x *T. timopheevi* had more chromosome pairing than might be expected from a simple summation of the pairing in haploids (1) and (2). The means for the hybrid were $17{\cdot}99_{\mathrm{I}}$, $1{\cdot}43_{\mathrm{II}}$ and $0{\cdot}05_{\mathrm{III}}$ whereas those for (1) + (2) were $20{\cdot}19_{\mathrm{I}}$, $0{\cdot}38_{\mathrm{II}}$ and $0{\cdot}02_{\mathrm{III}}$. Evidence was therefore obtained of intergeneric chromosomal homologies which might otherwise have been unsuspected if the haploid forms of the parents had not been investigated.

298 RATTAN SINGH, BISWAS, T. D. & DAS, N. B.
**Nicotinic acid content of wheat as influenced by variety and locality.**
Indian J. agric. Sci. 1956 : **26** : 381–89.

Values are given for nicotinic acid content and grain weight of NP52 and C591 grown in several localities and of 20 other varieties grown at Delhi and Pusa.

299 LYSENKO, O. T.
**(The dependence of the change of spring into winter wheat on the date of the second autumnal sowing).**
Agrobiologija (Agrobiology) 1957 : No. 1 : 67–71. [Russian].

Milturum 321, Odessa 13 and Lutescens 1163 gave rise to winter forms on sowing in the autumn for two seasons at Gorki Leninskie and the change in habit was directly related to the date of sowing in the autumn of the second year. Early sowing provided conditions of illumination more favourable to the development of winter forms than late sowing. This is thought to account for the greater number of winter plants obtained from early sowing.

300 SARKISJAN, N. S.
**(Selectivity of fertilization and the phenomenon of constant reproduction in wheat).**
Ž. obšč. Biol. (J. gen. Biol), Moskva 1957 : **18** : 103–11. [Russian].

Experiments conducted in Armenia on wheats fertilized by (1) mixed pollen of other varieties or (2) by self pollen + pollen of other varieties showed that all wheats preferred the pollen of a particular variety. In pollination exclusively with the pollen of other varieties the pollen of one component was always selected from a mixture and in pollination with self pollen + foreign pollen, self pollen was selected.

301 Sarič [Sarić], M.
**(The importance of the age of the pistil in the inheritance of some characters).**
Agrobiologija (Agrobiology) 1957 : No. 1 : 132–33. [Russian].

The effects of fertilization 1–10 days after emasculation upon the grain sets and inheritance of awn characters are described in the wheat crosses Bánkút 1205 x Regent and the reciprocal hybrid, investigated in Jugoslavia.

302 Mkrtčjan, A. A.
**(Overcoming depressed vitality in wheat hybrids by supplementary fertilization with foreign pollen).**
Ž. obšč. Biol. (J. gen. Biol.), Moskva 1957 : **18** : 112–20. [Russian].

Bengalense x Lutescens 1163, Lutescens 1163 x Hostianum 0237 and a number of other soft wheat hybrids, all characterized by good growth and development in the $F_1$, were obtained at the Armenian Institute of Genetics by adding rye pollen to the pollen of the male parent. When these wheats are crossed in the ordinary way the $F_1$ plants are low in vitality.

303 Mar'jahina, I. Ja.
**(A description of the flowering of interspecific hybrids of wheat).**
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1957 : No. 3 : 76–80. [Russian].

Floral biology of self-fertile and self-sterile plants in hybrid progenies of *Triticum vulgare* x *T. turgidum* under Odessa and Moscow conditions is described. It was found that self sterility was heritable. A method facilitating cross pollination of self-sterile plants is outlined briefly.

304 Avakjan, A. A.
**(The role of interspecific hybridization in the development of branched soft wheats).**
Dokl. Vsesojuzn Akad. sel'skohozjajstv. Nauk Lenin. (Proc. All-Un. Lenin Acad. agric. Sci.) 1957 : No. 2 : 3–7. [Russian].

A report on crossing soft wheat with branched *Triticum turgidum* at Gorki Leninskie, together with the writer's observations on the nature of interspecific hybridization, is presented. It is thought that the principal effect of interspecific hybridization is to shatter inheritance and that the hybrids neither combine the characters of the parent species nor breed true with regard to acquired characters. Many forms of soft winter wheat with a high proportion of branched ears were obtained by first crossing soft wheat with branched *T. turgidum* and then back-crossing branched soft-grained $F_5$ segregates to soft winter wheats with ordinary ears.

305 Samsonov, M. M.
**(The gluten content of wheat in the USSR).**
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1957 : No. 3 : 32–39. [Russian].

Analyses of different varieties carried out by the State Varietal Commission showed that the gluten content depended on variety, provenance and external conditions. Varietal differences in gluten content and gluten properties are referred to briefly and some high-quality bread wheats are listed.

306 Laumont, P. & Cunin, G.
Note sur les blés durs lavés. **(A note on washed-out hard wheats).**
Élevage et Cultures, Alger 1956 : No. 90 : 1–15.

Varieties have been found to differ in their susceptibility to washing out and mealiness. The late varieties are less susceptible. Washing out involves loss of colour in the outer layer of the grain and sometimes of the endosperm. Mealiness is when the grain becomes partly or completely opaque and floury. Various environmental factors, such as long rainfall when the grain is maturing, are responsible for these conditions.

307 Shoup, N. H., Pell, K. L., Seeborg, E. F. & Barmore, M. A.
**A new micro mill for preliminary milling-quality tests of wheat.**
Cereal Chem. 1957 : **34** : 296–98.

'A two-break milling machine designed for the rapid milling-quality evaluation of 5-g. wheat samples is described. Essential components are two sets of break rolls, a feeding device, and a sifter. Four samples are milled simultaneously, and approximately 75 samples can be milled per hour.' [Authors' summary].

308 Seeborg, E. F. & Barmore, M. A.
**A new five-gram milling-quality test and its use in wheat breeding.**
Cereal Chem. 1957 : **34** : 299–303.

The test described involves hydrating 5 g. samples to about 17·5% moisture, grinding them by means of the mill referred to above

f. 307], passing the meal over the No. 38 wire reen with which the mill is fitted, and weighing ie bran, which remains on the screen. Two oerators are able to process 400–600 hydrated imples per day. Data on the $F_4$ of HRP x wned Onas indicated that bran weight is uantitatively inherited and may be determined y several genes. Of the $BC_2$ lines, 4·6% were gnificantly better in milling quality than the ecurrent parent Awned Onas. A compre-ensive study of the inheritance of bran weight now under way as part of the programme of nproving wheat in the Pacific Northwest.

09 Barmore, M. A.
**A summary of the quality and protein content of western wheat varieties.**
Cereal Sci. today 1957 : **2** : 162–65.

ata on the milling score, protein content and ther quality components of common American arieties and new selections have been subjected o statistical analysis. Charts have been com-iled to show how varieties compare with espect to pastry and bread flour quality.

10 Atkins, I. M. & Finney, K. F.
**Quality characteristics of two pairs of isogenic lines of wheat.**
Agron. J. 1957 : **49** : 351–53.

. detailed account of investigations referred to reviously [XXVII, 1308] is provided.

11 Harris, R. H., Sibbitt, L. D., Scott, G. M. & Bruner, G. H.
**Comparative milling and baking quality of North Dakota wheats.**
Bi-m. Bull. N. Dak. agric. Exp. Sta. 1957 : **19** : 87–94.

he new spring wheats Conley (ND1), Rushmore, elkirk, ND3, 3880.227 and Lee are compared respect of milling and baking quality and ough properties.

12 Sibbitt, L. D. & Harris, R. H.
**New quality data on Dakota durums.**
Bi-m. Bull. N. Dak. agric. Exp. Sta. 1957 : **19** : 115–18.

even varieties grown in North Dakota are ompared in respect of quality and suitability r making semolina and macaroni.

13 Nakagawa, M. & Watanabe, S.
**(Studies on the grain quality of wheat varieties. I. Genes controlling the mealiness and vitreousness of wheat).**
Ikushugaku Zasshi/Jap. J. Breeding 1957 : **6** : 260–64. [Japanese].

he genetics of grain texture was studied using $_2$ segregation data from 15 crosses involving 8 Japanese varieties. Three loci and multiple alleles at each locus are believed to be involved. Dominance and epistasis relationships of the dominant alleles are inferred to be $I_1<I<G_3<G_2<G_1<G<M_2<M_1<M$. The $M$ and $I$ alleles are responsible for mealy endosperm, the $G$ alleles for vitreousness.

314 Manzjuk, V. T.
**(How external conditions affect the development of the size of the cells of the leaf epidermis of spring-wheat hybrids).**
Dopov. Akad. Nauk Ukrajin. RSR (Proc. Ukrain. Acad. Sci.) 1957 : No. **3** : 313–16 [Ukrainian].

The $F_1$ and $F_2$ of Melanopus 69 x Dlinnokolosaja 120 [Long-eared 120] and Narodnaja [People's] x Dlinnokolosaja 120, grown under irrigation, produced leaves with the epidermal cells equal in size to those of Dlinnokolosaja 120. Under rainfed conditions, the epidermal cells of the hybrids were similar in size to those of Narodnaja and Melanopus, which require less moisture.

315 Sen, S. & Somayajulu, P. L. N.
**A study on wheats from Afghanistan.**
Indian J. Genet. 1956 : **16** : 105–12.

This is an account of the variation found in a collection of wheats from Afghanistan. The species and varieties in the collection are listed. Observations have been made on spike and grain characters, maturity and rust resistance. Many of the wheats showed resistance to one or more rusts and possessed desirable grain characters.

316 Jakubciner, M. M.
**(New botanical forms of wheat of value for breeding).**
Bjull. vsesojuzn. Inst. Rasten. (Bull. All.-Un. Inst. Pl.-Industr.) 1956 : No. **2** : 33–34. [Russian].

Some of the wheats introduced from Yugoslavia, both local forms and a hybrid Maksimirska x Križevečka MKVI, produce very large grains, with a 1000-corn weight of up to 66·7 g., when grown at Leningrad. The Italian wheats of the Cologna type are similar and may, it is thought, be derived from them. They are classed as a new subspecies, *Triticum aestivum* ssp. *grandisemineum*.

317 Anant Rao, N. K., Gupta, M. L., Shisodia, V. N. S. & Kapoor, P. N.
**Response of wheat varieties to different sowing dates and seed rates.**
Indian J. agric. Sci. 1956 : **26** : 351–57.

Three years testing indicated that Pb.591 is more suitable than C13 and Local for cultivation in Agra. A seed rate of 40 seers per acre benefits Pb.591 but Local does better at 30 seers per acre.

318 FEOFANOVA, M. D.
**(Application of radioactive phosphorus for testing varieties for cold resistance).**
Bjull. vsesojuzn. Inst. Rasten. (Bull. All-Un. Inst. Pl.-Industr.) 1956 : No. 2 : 14–17. [Russian].

The observations reported show that the absorption of $P^{32}$ was less at 5–6° C. than at 18° and the reduction was greater in spring than in winter wheat. Furthermore, the reduction was less in winter-hardy wheats than in less hardy varieties, there being a direct proportionality between the reduction of absorption and the loss of plants at — 14° C.; in hardy wheats such as Lutescens 116 and Lutescens 329 the absorption at 5–6° was respectively 97·1 and 91·2% of that at 18°. Further experiments showed that the hardy variety Alabasskaja absorbed $P^{32}$ more actively at 7–10° C. than the less hardy variety Ukrainka, although the length of the vernalization phase in the two wheats is the same. Varieties of maize and lentil from high altitudes, assumed to be more hardy, absorbed $P^{32}$ more actively at low temperatures than those from lower altitudes and winter vetches more actively than spring vetches, but in experiments with potatoes no correlation has been observed so far.

319 LUK'JANENKO, P. P.
**(A new winter wheat variety resistant to lodging).**
Dokl. vsesojuzn. Akad. sel'skohozjajstv. Nauk Lenin. (Proc. All-Un. Lenin Acad. agric. Sci.) 1957 : No. **3** : 3–6. [Russian].

This report on recent trials of a few varieties from Krasnodar gives further details of Bezostaja 4 [Awnless 4] and Bezostaja 4/1 [cf. XXVI, 3193]. Bezostaja 4/1 outyields the initial form Bezostaja 4 both after a sunflower crop and after fallow and combines the hardiness and good baking and milling properties of its parent with improved resistance to lodging and *Puccinia*.

320 **New Kentucky wheat.**
What's New Crops Soils 1957 : **9** : No. 9 : p. 27.

Todd is a mid-season variety notable for its high yield, strong straw and winter hardiness. It is resistant to Hessian fly, loose smut, soil-borne mosaic and powdery mildew. It has intermediate rust resistance and is susceptible to *Septoria*. The kernel is softer and has a higher protein content than that of Vigo.

321 POWERS, H. R. (JUN.) & SANDO, W. J.
**Genetics of host-parasite relationship in powdery mildew of wheat.**
Phytopathology 1957 : **47** : p. 453. (Abst.)

Normandie, possessing the independent dominant genes $Ml_t$ and $Ml_u$ for resistance to *Erysiphe graminis* var. *tritici*, was crossed with Little Club, containing the recessive alleles. $F_2$ and $F_3$ plants were inoculated with culture 116–3, virulent against $Ml_t$ but not $Ml_u$, and with culture 116–2, virulent against $Ml_u$ but not $Ml_t$. The four possible homozygous genotypes of the host were identified by means of these inoculations and then used to investigate the inheritance of pathogenicity in the progeny of a cross between the two cultures of the pathogen. The results indicated that for each of the genes $Ml_t$ and $Ml_u$ a corresponding gene for virulence existed in the pathogen.

322 NAKAGAWA, M.
**(Studies on the resistance of wheat varieties to *Gibberella saubinetii*. VIII. Relations between substances characterizing susceptibility of wheat varieties to *G. saubinetii*, genes and enzymes).**
Ikushugaku Zasshi/Jap. J. Breeding 1957 : **6** : 255–59. [Japanese].

The following correlations between the resistance genes *A*, *B* and *C* and enzyme activity have been established. Plants carrying *A* have a high sucrase activity while plants carrying *B* have a high maltase activity. Varieties carrying *C* have a high content of inorganic phosphate which may indicate a high content of adenosinetriphosphatase. [Cf. XXVI, 1175 and XXVII, 2814].

323 AASTVEIT, K. & HAUGDAL, S.
Fotsyke på korn. **(Foot rots of cereals)**
Forskn. Fors. Landbr. 1957 : **8** : 185–202.

In this general review of the biology, economic importance and control of *Ophiobolus graminis* and *Cercosporella herpotrichoides*, it is noted that in trials at Vollebekk, Norway, the seven wheat varieties tested differed little in reaction to *O. graminis*, while good resistance to *C. herpotrichoides* was found in *Triticum monococcum* 'CI2433' and appreciable resistance in *T. compactum* 'Little Club'.

324 PROKOP'EV, M. P.
**(A variety developed from local populations).**
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1957 : No. 3 : 51–52. [Russian].

Selection of spring wheats among the local populations in the Udmurt' ASSR, mainly among red-eared forms which are said to be more adapted to climatic conditions in northern Russia, is discussed. The results include a new variety Milturum 10, which outyields the standards Lutescens 62 and Lutescens 2351, and shows resistance to *Ustilago* and tolerance of drought at the tillering stage.

325 ARDAŠEV, M. I.
**(The spring wheat Baškiria 4).**
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1957 : No. 2 : 46–47. [Russian].

Baškiria 4 (Pionerka [Pioneer] x Lutescens 53/12), bred at the Baškirian Breeding Station, outyields the standard Lutescens 62 in the steppe districts and shows improved resistance to lodging and *Ustilago*. It has large red grain, with 58% to 81% of vitreous grain, and its baking and milling qualities are good.

326 **The situation regarding yellow rust attack in wheat in Europe.**
Sticht. Ned. Graan-Centrum, Wageningen 1957 : No. 1 : 13–19.

Together with information on the prevalence of yellow rust in Europe, the international scales for defining growth of wheat, infection type and degree of attack, agreed on at the 1st European Yellow Rust Conference held at Brunswick, Germany, on 21 and 22 February, 1956, are presented. International trials for studying physiological races of the fungus and the reactions of different wheats in different localities have been established.

327 DAVYDOV, N. N.
**(A new winter wheat variety).**
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1957 : No. 2 : 44–46. [Russian].

VIR46 [Institute of Plant Industry 46] was bred at the Kuban' Research Station from VIR4 (Florence x Ukrainka) and Skorospelka 1 [Early 1]. It shows resistance to *Puccinia glumarum* and *P. triticina* and outyields the standard Novoukrainka 84 and such varieties as Bezostaja 4 [Awnless 4] and Rannjaja 27 [Early 27] and its baking and milling properties are good.

328 POPOW, G.
Sortenprüfung und Züchtung beim Sommerweizen. **(Variety testing and breeding with spring wheat).**
Mitt. schweiz. Landw. 1957 : **5** : 122–29.

Information is given on the behaviour of spring wheats from a number of different countries, tested in Switzerland as possible substitutes for Huron and Lichti; the most promising are Svenno from Sweden and Kärntner Früher [Carinthian Early] from Austria but none proved superior to Lichti in the Alps or sufficiently rust resistant for the plains. Further varieties are being tested and breeding work is in progress, the first objective being to produce a variety resistant to stem rust by crossing Huron with Newthatch; seed of a selection from this cross will be ready for distribution in 1958; others excel Huron in yield, standing capacity and resistance to stem rust. Selections from some other crosses show promise of being equal to Lichti in yield and superior in standing capacity and resistance to stem rust.

329 POLIŠČUK, V. K.
**(The role of intravarietal and intervarietal crossing in improving disease resistance of wheat).**
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1957 : No. 2 : 37–39. [Russian].

The resistance of Lutescens 17 and Ukrainka to *Puccinia*, *Ustilago* and *Tilletia* was improved in Ukrainian experiments which involved (1) intravarietal open pollination and (2) restricted open pollination with a few other varieties.

330 WATSON, I. A.
**Further studies on the production of new races from mixtures of races of *Puccinia graminis* var. *tritici* on wheat seedlings.**
Phytopathology 1957 : **47** : 510–12.

New virulent races of the above fungus have been derived by mixing, on wheat seedlings, uredospores of an avirulent red race and a virulent orange race. The four new races are all red-spored and have been maintained through six uredial generations, showing consistent reactions on differential varieties. The results are interpreted as showing further evidence of genetic variation in the dicaryophase of *P. graminis* var. *tritici*.

331 WATSON, I. A.
**Mutation for increased pathogenicity in *Puccinia graminis* var. *tritici*.**
Phytopathology 1957 : **47** : 507–09.

Spontaneous changes in pathogenicity have been observed in races NR–1, 11 and GB–1 of the above fungus when Lee wheat was infected with inoculum from single spore cultures increased on Little Club at the University of Minnesota.

332 HASSEBRAUK, K.
Die physiologische Spezialisierung des Weizenbraunrostes (*Puccinia triticina* Erikss.) in Deutschland im Jahre 1955.
**[Physiological specialization of brown rust of wheat (*P. triticina*) in Germany in the year 1955].**
NachrBl. dtsch. PflSchDienst., Berl. 1957 : **9** : 125–27.

Race 17 was found in 82% of the 230 samples obtained from 147 localities and race 1 was present in 39%. Races 20, 52, 53 and 93 were also identified.

333 BASILE, R. & LEONORI-OSSICINI, A.
Razze fisiologiche di *Puccinia rubigo-vera tritici* (Erikss. et Henn.) Carl. (=*P. triticina* Erikss.) in Italia, nel 1953–1954.
**[Physiological races of *P. rubigo-vera* var. *tritici* (Erikss. and Henn.) Carl. (= *P. triticina* Erikss.) in Italy in 1953-1954.]**
Ann. Sper Agr. 1957 : **11** : No. 4 : cvii–cxiii.

The information contained in this article has already been summarized from another source [XXVII, 2829].

334 VALLEGA, J. & ŽUKOVSKIJ, P. M.
**(Testing ecological types belonging to different wheat species for resistance to the physiological races of brown and stem rust by artificial inoculation under Argentine conditions).**
Bjull. vsesojuzn. Inst. Rasten. (Bull. All-Un. Inst. Pl.-Industr.) 1956 : No. 2 : 23–29. [Russian].

A number of wheats from the Soviet collection were tested in Argentina against the two main Argentine races of *Puccinia triticina* and the three of *P. graminis*. Only *Triticum monococcum*, *T. aegilopoides*, *T. timopheevi* and certain forms of *T. durum* and *T. turgidum* proved resistant to all races; some varieties of *T. aestivum* were resistant to certain races but not to others.
The results are tabulated.

335 JOHNSON, T. & GREEN, G. J.
**Physiologic specialization of wheat stem rust in Canada, 1919 to 1955.**
Canad. J. Plant Sci. 1957 : **37** : 275–87.

A record is given of the physiological races of *Puccinia graminis* var. *tritici* collected on cereals and grasses from 1919 to 1955. A discussion is presented of the possible selective effect on the population of rust races produced by changes in the varieties of wheat cultivated. The use of accessory differential hosts in the identification of new biotypes is considered.

336 STEWART, D. M., COTTER, R. U. & ROBERTS, B. J.
**Physiologic races of *Puccinia graminis* in the United States in 1956.**
Plant Dis. Reptr. 1957 : Suppl. 245 : 53–60.

The races of *P. graminis* var. *tritici* occurring most frequently among isolates from uredial collections were races 56 and 15B, found in 31% of the isolates respectively [cf. XXVII, 342]. The group consisting of races 17–29 accounted for 14% and race 11, together with the closely-related race 32, for 13%. Certain wheats proved useful as supplementary differentials for distinguishing subraces. *Triticum timopheevi*, CI3255 and ND3(CI13159) differentiated four subraces of race 11, and the first two of these wheats, together with Tremez Molle, four subraces of race 15B. Five subraces of race group 17–29 were identified by means of CI3255, ND3 and RL3206.

Race 7 remained the most prevalent race of *P. graminis* var. *avenae*, comprising 66% of the uredial isolates. A new subrace to which Bond was moderately resistant was identified; it was tentatively assigned to race 1. So far as is known, this is the first indication of any gene or genes for stem-rust resistance in this variety.

337 KNOTT, D. R.
**The inheritance of rust resistance. II. The inheritance of stem rust resistance in six additional varieties of common wheat.**
Canad. J. Plant Sci. 1957 : **37** : 177–92.

The following genes for resistance to races 15B and 56 of stem rust have been found: (1) Africa 43, *Sr*6; (2) Kenya C9906, *Sr*6 *Sr*7; (3) Kenya 338.AC.2.E.2, *Sr*7 *Sr*9 *Sr*10; (4) Egypt Na101, *Sr*7; (5) Veadeiro, *Sr*9 *Sr*10; and (6) Red Egyptian type (PI170910), *Sr*6 *Sr*8 *Sr*9 [cf. XXVII, 439]. In addition, Veadeiro probably contains two additive genes for mature-plant resistance to race 15B. In Kenya 338.AC.2.E.2 there is one main modifier of the resistance conditioned by *Sr*7.

338 Basile, R.
**A diagnostic key for the identification of physiologic races of *Puccinia rubigo-vera tritici* grouped according to a unified numeration scheme.**
Plant Dis. Reptr. 1957 : **41** : 508–11.

A key is provided by means of which 181 races of the above pathogen may be grouped into 27 unified races [XXVII, 1631] on the basis of their pathogenicity to five differential wheat varieties.

339 Bahn, A. N.
**Serological differentiation of physiological races within the cereal rusts.**
Diss. Abstr. 1957 : **17** : Publ. No. 20,617 : 720–21.

Success in serological differentiation of races of *Puccinia graminis* var. *tritici*, *P. graminis* var. *avenae*, *P. rubigo-vera* var. *tritici* and *P. sorghi* by the complement fixation and precipitin tests depended upon the genetic homogeneity of the cultures used and also upon the method of preparation and the purity of the antigens.

340 Hayden, E. B. (Jun.)
**Progressive development of infection by *Puccinia graminis* var. *tritici* Eriks. and E. Henn. (Guyot) on certain varieties of wheat and the relation of stem rust to yield.**
Diss. Abstr. 1956 : **16** : Publ. No. 18,931 : 2262–63.

A report is given of investigations on the development of race 15B upon tolerant and nontolerant wheats under various conditions of artificial and natural infection and on the influence of attack by this race upon yield. The varieties studied comprised Lee, Marquis, Mida, Carleton, Nuggett and Sentry.

341 Gol'bek, A. K. & Efimov, M. I.
**(A new wheat variety for growing under rainfed conditions in southern Kazahstan).**
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1957 : No. **3** : 49–51. [Russian].

Krasnaja Zvezda [Red Star] was obtained by single-plant selection from Turkmenian material at the Krasnovodopadskaja Breeding Station, Kazahstan. It outyields the spring standards Pseudoturcicum 2115 and Erythrospermum 841 and shows improved resistance to *Puccinia*, *Tilletia* and *Ustilago*. It is resistant to drought, has a short growth period and its baking and milling properties are good.

342 Hilu, H. M. & Bever, W. M.
**Inoculation, oversummering, and suscept-pathogen relationship of *Septoria tritici* on *Triticum* species.**
Phytopathology 1957 : **47** : 474–80.

All varieties of *T. vulgare* and some of *T. durum* were found to be susceptible to *S. tritici* under greenhouse conditions at the Illinois Agricultural Experiment Station, although their reaction varied under field conditions. Larger subepidermal pycnidia were produced in susceptible than in resistant or intermediate varieties but where infection was established in intermediate or resistant varieties the suscept-pathogen relationship was essentially the same as with susceptible varieties.

343 Hrushovetz, S. B.
**Effect of amino acids on the virulence of *Helminthosporium sativum* to wheat seedlings.**
Phytopathology 1957 : **47** : 261–64.

A marked variation in the pathogenicity of *H. sativum* isolates to wheat seedlings was observed, at the University of Alberta, after the fungus had been cultivated on a medium containing 0·1% of one of nine aminoacids. It is suggested that during growth in culture selection operates in favour of heterocaryons requiring for their growth the particular aminoacid which has been included. The subsequent pathogenicity of the isolate will depend on the presence and availability of the specific aminoacids in the host tissues.

344 Roberts, D. W. A.
**Sawfly resistance in wheat. II. Differences between wheat grown in the greenhouse and on irrigated land.**
Canad. J. Plant Sci. 1957 : **37** : 292–99.

Seven varieties of wheat were tested for resistance to *Cephus cinctus*. In Rescue, H46146, Golden Ball, Red Bobs and Thatcher, a significantly higher percentage of infested stems was cut from the crop grown in the greenhouse in either summer or winter than from the crop grown on irrigated land. In H4191 and Melanopus the differences were similar but not significant. The resistance of wheat on irrigated and dry land appears to differ. Stem solidity is usually associated with resistance on dry land but this is not always the case in other environments. [Cf. XXV, 1909].

345 Caldwell, R. M., Compton, L. E., Cartwright, W. B., Schafer, J. F. & Patterson, F. L.
**Utilization of the W38 resistance of wheat to Hessian fly.**
Agron. J. 1957 : **49** : p. 520.

The Hessian fly resistance of W38, controlled by the gene pair $H_3H_3$, is now commercially available in the soft red winter wheat variety Dual [cf. XXVI, 1170], which shows high field resistance to the common races of the pest but is not resistant to a specialized race selected in greenhouse studies. It is suggested that widespread use of Dual will favour the propagation of this specialized race, which at present occurs only in small numbers, and the combination of other resistance factors with those from W38 is in progress.

346 Matsumoto, K., Shimotsuma, M. & Nezu, M.
**The amphidiploid $M^uM^uDD$ and its hybrids with *Aegilops ventricosa*.**
Wheat Inform. Serv. Kyoto 1957 : No. 5 : 12–13.

Details are given of the chromosome pairing and fertility of a colchicine-induced amphidiploid of *Ae. uniaristata* x *Ae. squarrosa* of the above genomic constitution and of a cross between this hybrid and *Ae. ventricosa*. It is concluded on the basis of cytological and morphological comparisons that the amphidiploid most closely resembles *Ae. ventricosa*.

347 Kihara, H., Yamashita, K., Tanaka, M. & Sakamoto, S.
**Geographical distribution of 4*x* and 6*x* forms of *Aegilops crassa*.**
Wheat Inform. Serv. Kyoto 1957 : No. 5 : 11–12.

All strains of *Ae. crassa* so far examined from Iran are 4*x* while both 4*x* and 6*x* forms have been found in material from Afghanistan. The material from Iran is recumbent with narrow dark green leaves and that from Afghanistan erect with broad light-green leaves. A new awnless 4*x* form has been collected in the southern province of Afghanistan where no 6*x* strains were found. It is suggested that the 6*x* forms originated from 4*x* *Ae. crassa* and a 2*x* species, probably *Ae. squarrosa*. An amphidiploid has been obtained from 4*x* *Ae. crassa* x 2*x* *Ae. squarrosa* and is morphologically identical with 6*x* *Ae. crassa*.

348 Mochizuki, A.
**B chromosomes in *Aegilops mutica* Boiss.**
Wheat Inform. Serv. Kyoto 1957 : No. 5 : 9–11.

A small closed bivalent has been observed during meiosis in $F_1$ plants of *Triticum timopheevi* x *Ae. mutica*, *Ae. bicornis* x *Ae. mutica* and *Ae. sharonensis* x *Ae. mutica*. Since all these $F_1$ plants had two more chromosomes than the expected number and only one clonally increased plant of *Ae. mutica* had been used as the pollen parent it is concluded that the supernumerary chromosomes are derived from this plant. Of 18 offspring from this plant six were found to have one B chromosome and 12 had three B chromosomes but the number frequently varied in different parts of the same plant. In plants with one B chromosome no pairing took place at metaphase I, univalents being distributed to the poles apparently at random, although the second division was equational, while meiosis was fairly normal in plants with three B chromosomes, with $7_{II}$ and $1_{III}$ at metaphase I. When univalents were present there was always an even number. No laggards were present at anaphase but in pollen development nondisjunction of the B chromosome occurred in the first division.

## OATS

349 Mikaelsen, K. & Aastveit, K.
**Effects of neutrons and chronic gamma radiation on growth and fertility in oats and barley.**
Hereditas, Lund 1957 : **43** : 371–80.

Height, number of straws per plant, number of flowers per head and seed fertility were determined in plants of the oat Sisu and barley Maja raised from seed exposed to neutrons and chronic $\gamma$ radiation. The following result is of particular interest. As indicated by reduction in seed fertility, barley was about three times more sensitive to neutron treatment than oats. Barley was however less sensitive to chronic $\gamma$ radiation than oats. It is suggested that the influence of neutrons upon seed fertility is inversely proportional to the number of chromosome complements and is primarily cytogenetical, whereas the effect of $\gamma$ treatment is predominantly extrachromosomal and physiological.

350 Horner, T. W. & Frey, K. J.
**Methods for determining natural areas for oat varietal recommendations.**
Agron. J. 1957 : **49** : 313–15.

By an analysis of variety x locality mean squares calculated for different patterns of subdivision of Iowa, the authors succeeded in partitioning the state into subareas for which variety x locality interactions were considerably reduced.

351 **New oat variety.**
Agric. Inst. Rev. 1957 : **12** : No. 3 : p. 4.

Shield, developed by the Experimental Farm, Kapuskasing, Ont., from crosses involving Victoria, Banner, Hajira, Roxton and Ajax, has been licensed for sale in Canada. It matures about a week earlier than Ajax and possesses better rust resistance, stronger straw and a more attractive kernel. It is also resistant to smut.

352 Schlehuber, A. M.
**A new source of high test weight in spring oats.**
Agron. J. 1957 : **49** : p. 519.

Early Clinton (CI 7192), selected from Clinton (CI 3971) at the Oklahoma Agricultural Experiment Station, has averaged 5·5 pounds more in test weight than Clinton and 3·9 pounds more than Andrew and is nine days earlier in heading than Clinton.

353 **New Minhafer oat resists more diseases.**
What's New Crops Soils 1957 : **9** : No. 8 : p. 27.

The above-named oat variety combines resistance to smuts and all races of crown and stem rust including 7A, and gives satisfactory yields. Released by the University of Minnesota, it is a yellow oat with a higher test weight, slightly larger kernels and greater straw strength and lodging resistance than Andrew, to which it is similar in height and maturity.

354 Stoa, T. E.
**Ransom oats.**
Bi-m. Bull. N. Dak. agric. Exp. Sta. 1956 : **19** : p. 18.

This variety has been already described [XXVII, 3956]. It is a selection from the cross Sac x Hajira-Joanette.

355 Suneson, C. A.
**Improved oat variety resistant to drought, shattering and stem rust, the new Indio shows promise.**
Calif. Agric. 1957 : **11** : No. 8 : p. 4.

Indio was selected from the $F_5$ of (Victoria-Richland x Fulghum) x Palestine. It has high resistance to drought, shattering and stem rust, but is susceptible to yellow-dwarf virus, suffers from lodging and is not suitable for high areas.

356 Brown, C. M. & Shands, H. L.
**Pollen tube growth, fertilization and early development in *Avena sativa.***
Agron. J. 1957 : **49** : 286–88.

Reckoning from the time of application of the pollen, some grains germinated within 5 min., penetration of the style by the tubes being completed in 15 min. The ♂ generative nuclei were capable of being in the proximity of the egg and pollen nuclei in 30 min., the ♂ gamete entering the egg within 4 hr. The fertilized egg could reach prophase in 13·5 hr., the 2-celled proembryo being seen 19 hr. after pollination.

357 Frey, K. J., Hall, H. H. & Shekleton, M. C.
**Inheritance and heritability of protein, niacin, and riboflavin in oats.**
J. Agric. Food Chem. 1955 : **3** : 946–48.

The low protein percentage of CI5298 behaved as a partially dominant character in a cross of this variety with Colo, an oat with a high protein content. In the cross of CI5298 with CI3656, however, the high protein percentage of the latter variety was partially dominant. The high protein percentage of Colo also showed a reversal of dominance and recessiveness according to the genetic background, being partially dominant in Mindo x Colo but recessive in the cross with CI5298 already mentioned. High contents of niacin and riboflavin were apparently dominant in all the crosses. Heritability percentages for niacin and protein contents ranged from 86 to 93, those for riboflavin from 0 to 52. Correlation coefficients between niacin and protein contents were significant at the 10% level but those between riboflavin and protein were not significant.

358 Karaul'nyj-Zverev, N. V.
**(The question of developing the character of double panicle in oats).**
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1957 : No. 2 : 52–60. [Russian].

Forms of Pobeda [Victory] and Moscow A–315 characterized by a forked panicle were bred at Mičurinisk; the first-mentioned form outyielded the initial variety by 8·5–20·1% and the other by 7·8–18·7%. The development of forked panicles was promoted by (1) improving nutrition of the plants by dressings with nitrogenous and potash fertilizers, especially at the third leaf stage, (2) early sowing and (3) intravarietal hybridization where florets from the lower subsidiary panicle were fertilized by pollen from the main panicle, or the florets on the main panicle by the pollen from subsidiary panicles. The first method of pollination was the more effective of the two.

359 Coffman, F. A.
**Factors influencing heat resistance in oats.**
Agron. J. 1957 : **49** : 368–73.

A summary is given of the results obtained from experiments carried out since 1936 by the Agricultural Research Service of the USDA to study heat resistance in many oat varieties. Exposure to 48°–51·5° C. for 45 minutes in a heat chamber gave good differentiation between varietal reactions. The results indicated that (1) resistance was greater after exposure of the plants to bright sunlight than after shading, prior to treatment, (2) raised temperatures before heat treatment increased the resistance of winter but not of spring oats, (3) maximum resistance was attained at the age of 40–55 days and at the bolting and early heading stages, (4) resistance tended to be greater in varieties with short or slender culms than in oats with tall or thick culms, (5) early-maturing varieties in both the spring and winter classes were usually more resistant than midseason and late-maturing varieties, (6) no definite correlation existed between resistance and morphological features or kernel colour although most varieties highly resistant to heat had awns and dark-coloured kernels, and (7) heat resistance was independent of disease resistance but was highly and positively correlated with winter hardiness. According to data obtained from Lee x Black Mesdag and an unnamed spring-oat selection x Hairy Culberson, susceptibility to heat was dominant over resistance.

360 Coffman, F. A.
**Cold-resistant oat varieties also resistant to heat.**
Science 1957 : **125** : 1298–99.

With emphasis on the correlation found between heat resistance and winter hardiness, a short account is given of results referred to in another paper [cf. 359].

361 **Putnam oat will be available soon.**
What's New Crops Soils 1957 : **9** : No. 9 : p. 26.

A short, early spring variety which gives high yields in southern Indiana has been developed at Purdue University. Putnam is superior to all other Indiana varieties in kernel size and test weight and has stiff straw. It is highly resistant to smuts, partially resistant to crown and leaf rust and resistant to race 8 of stem rust.

362 Huffman, M. D.
**The *Septoria* disease of oats.**
Iowa St. Coll. J. Sci. 1957 : **31** : 447–48. (Abst.).

From the USDA Cereal Investigations collection of 4751 oat selections 24 were found to possess greater resistance to *Leptosphaeria avenaria* than any commercial variety but none were immune. Resistance was independent of maturity but many of the resistant selections were a few days later than most varieties grown in Iowa. All but two of the resistant selections include Victoria in their parentage and are susceptible to *Helminthosporium victoriae.*

363 Hooker, A. L.
**Cultural variability in *Septoria avenae* through successive single-macrospore transfers.**
Phytopathology 1957 : **47** : 460–68.

Single-macrospore cultures of *S. avenae* (*Leptosphaeria avenaria*) and monospore subcultures obtained from them were found to show a high degree of variability in cultural characteristics at the Wisconsin Agricultural Experiment Station and a process of continuing mutation within a heterocaryotic system is suggested to explain these results.

364 Kolar, J. J.
**Inheritance of stem rust resistance in oats.**
Iowa St. Coll. J. Sci. 1957 : **31** : p. 455. (Abst.).

Studies on the seedling reaction to races 5, 7, 7A and 8 of *Puccinia graminis* var. *avenae* at high and low temperatures were carried out with $F_3$ progeny from 26 of the possible crosses among eight oat strains, CI 5870 (Sac x Hajira-Joanette), RL559.16 (Hajira), CI 6537 (Clinton x Ukraine), CI 6957 ([Landhafer x (Mindo x Hajira-Joanette)] x Andrew), CI 3259 (Ukraine), CI 4024 (Canuck), CI 787 (Richland) and CI 551 (White Tartar). The following results were obtained. (1) At low temperatures the resistance of CI 5870 to race 7 is conditioned by two genes and to races 6, 7A and 8 by single factor pairs but at high temperatures only one gene for resistance to race 7A remained effective. It was concluded that this strain possesses the *A*, *B* and *C* genes from Richland and Hajira. Similar conclusions were reached for RL559.16. (2) The resistance of CI 6537 to races 6 and 7 was determined by single factors while resistance to race 8 was controlled by two factors at low temperatures but only one at high temperatures.

It was concluded that this strain contained the *B*, *C* and *D* genes from Hajira and White Tartar. (3) Two types of resistance were found among the progeny of crosses involving CI 6957, one group possessing two genes for reaction to races 7 and 8 and one each for reaction to races 6 and 7A while the other group was resistant to races 7, 7A and 8 at all temperatures and possessed genes from Richland and White Tartar. (4) The Hajira factors for resistance were readily combined with either the Richland or White Tartar genes, or both, in crosses where these genes were linked in the coupling phase. (5) No resistance to any races was contributed by CI 3259.

365 Ivanoff, S. S.
**The Mid-South oat variety. A Victoria-blight resistant mutant.**
J. Hered. 1957 : **48** : 101–07.

The Victoria-blight resistant variety Mid-South [cf. XXVII, 3965] was developed from a spontaneous mutant discovered among several million susceptible seedlings of Victorgrain 48–93 by means of the mass-screening technique described in an earlier paper [XXII, 1844]. In addition to its high degree of resistance to Victoria blight, Mid-South differs from its parent in having a greater capacity of surviving freezing in the field, as the result of the cold resistance of its root system. The mutant is less resistant than the parental variety to races of crown rust such as 202 and 203. Both mutant and parent have shown immunity from two races of *Ustilago avenae* but susceptibility to a third, fair to good resistance to culm rot caused by a strain of *Helminthosporium sativum* (*Cochliobolus sativus*), mosaic and *Erysiphe graminis* var. *avenae*, and susceptibility to stem rust. In forage yield Mid-South is about equal to Victorgrain 48–93 and in grain yield equal or superior.

366 **The new Coker Suregrain oat variety.**
Sth. Seedsman 1957 : **20** : No. 8 : 25, 44.

Suregrain was developed from the cross (Arlington x Delair) x Trispernia. It is highly resistant to *Helminthosporium victoriae* and all races of crown rust and smut prevalent in the United States. Suregrain is suitable for grain and grazing in southern regions, the yield is high and the straw moderately stiff and short.

367 Dahms, R. G. & Wood, E. A. (Jun.)
**Evaluation of greenbug damage to small grains.**
J. econ. Ent. 1957 : **50** : 443–46.

Three oat varieties showed marked differences in reduction of yield caused by *Toxoptera graminum* in Oklahoma. Andrew suffers light injury if the infestation is of short duration. Cimarron is very attractive to the pest but has a marked capacity to recover.

## RYE

368 Dumon, A. G. & Laeremans, R.
Contribution à l'analyse génétique de l'anthocyane du seigle (*Secale cereale* L.)
**[A contribution to the genetical analysis of the anthocyanin of rye (*Secale cereale*)].**
Bull. Jard. bot. Brux. 1957 : **27** : 507–13.

Two independent factors $A_1$ and $A_2$ were found to control the production of anthocyanin in plants of the *virescens* type. $A_1$ is dominant to $A_2$. The genotypes $A_1A_1a_2a_2$ $WW$, $A_1A_1A_2A_2WW$ and $a_1a_1a_2a_2WW$ are believed to be responsible for pinkish yellow, deep pink and canary yellow phenotypes respectively.

369 Rees, H.
**Genotypic control of chromosome behaviour in rye. IV. The origin of new variation.**
Heredity 1957 : **11** : 185–93.

A cross was made between two inbred lines (P2 and P5) differing with respect to chiasma frequency and the occurrence of premeiotic errors which result in pollen-mother cells with extra nuclei or micronuclei in which the chromosomes are frequently broken and invariably retarded in development at the early stages of meiosis [cf. XXV, 2974 and XXVII, 1678]. Such errors are found in P5 but not in P2. The expression of the characters of premeiotic errors within anthers is such that abnormal and normal cells may develop side by side. Furthermore, in some anthers all the pollen mother cells may be normal while in other anthers of the same plant some cells are abnormal. Data on families within the $F_3$–$F_5$ provided evidence of recombination of genes affecting the penetrance and expressivity of premeiotic errors, and also of recombination of genes controlling chiasma frequency (expressed as the average per bivalent from scoring 20 PMC's per plant). Recombination was also detected when the two characters were considered jointly; the two characters were apparently independently inherited. The significance of variation within anthers in the proportions of normal and abnormal PMC's, caused through recombination, is briefly discussed in relation to the problem of differentiation and the role of natural selection in adjusting the relative amounts of the component tissues of an organ.

370 Müntzing, A.
**Frequency of accessory chromosomes in rye strains from Korea.**
Wheat Inform. Serv. Kyoto 1957 : No. 5 : 16–18.

The average frequency of accessory chromosomes in seven strains of rye from Korea was found to be much higher than in strains from any other geographical region so far studied, the percentage of plants with accessories ranging from 19·4 to 91·5.

371 Antropova, V. F.
**(Tetraploid rye).**
Bjull. vsesojuzn. Inst. Rasten. (Bull. All-Un. Inst. Pl.-Industr.) 1956 : No. 2 : p. 44. [Russian].

Tetraploid rye obtained from Germany has been found to have chromosome numbers of $2n = 28$ and 27; when grown in the USSR it produced strong straw free from lodging, large grains with a 1000-corn weight of up to 60 g. and a protein content varying from 14·2 to 18·8%. When grown in isolation from diploid rye its self fertility amounted to 40%.

372 Winterrogge, 1957. **(Winter rye, 1957).**
Landbouwvoorlichting 14 : Bijl. 14 ; Ber. Rassenkeuze 1957 : No. 231 : Pp. 2.

Details of grain and straw yields of seven diploid varieties tested in different soil types in the Netherlands are presented together with a brief description of each variety. Information on the performance of two tetraploids is also provided.

373 Hilpert, G.
**Effect of selection for meiotic behaviour in autotetraploid rye.**
Hereditas, Lund 1957 : **43** : 318–22.

$C_4$ autotetraploids developed from the spring rye Sv0201 (Petkus x Od) at Svalöf, Sweden, consisted of three groups: (1) unselected, (2) a population resulting from selection in the $C_1$–$C_3$ for high fertility and (3) a population which was the outcome of selection in the $C_1$–$C_3$ for high tillering capacity. Groups (2) and (3) did not differ significantly in frequencies of univalents, bivalents and multivalents, and were less meiotically irregular than group (1). The $C_4$ material was divided into three groups respectively regular, irregular and intermediate in meiotic behaviour. The $C_5$ populations did not differ significantly in frequency of irregularities. The population resulting from selection for irregular meiosis tended however to have a higher frequency of zigzag quadrivalents.

374 Ukolov, A. A.
**(Intervarietal pollination in winter rye).**
Agrobiologija (Agrobiology) 1957 : No. 1 : 119–20. [Russian].

Plants of Vjatka Moskovskaja [Moscow Vjatka], Timirjazevskaja, Tula and Falenki raised from open-pollinated hybrid seed outyielded those of the pure varieties at the Timirjazev Breeding Station. The effects of supplementary pollination carried out 1–3 times upon the yield and the size of grain of the above varieties are discussed.

375 Lundquist, A.
**Self-sterility in autotetraploid rye.**
Wheat Inform. Serv. Kyoto 1957 : No. 5 : 15–16.

Evidence is presented suggesting that with diploid pollen a single locus for incompatibility is not able to cause inhibition of pollen-tube growth.

376 Antropova, V. F.
**(Use of *Secale kuprijanovii* Grossh. as green fodder).**
Bjull. vesesojuzn. Inst. Rasten. (Bull. All-Un. Inst. Pl.-Industr.) 1956 : No. 2 : 21–22. [Russian].

A form of *S. kuprijanovii* from the Krasnodar area is described as having extremely high tillering capacity, tall straw and large grain with a protein content of 16·7%, which is 3–5% higher than that in Vjatka rye. It is resistant to mildew, brown rust, frost and drought and has given over 200 c. of green matter, with a high content of protein and carotene, per ha. It is perennial but has a brittle rachis; in the hope of obviating this defect it is being crossed with forms with tough rachis.

377 Fadrhons, J.
Odrůdové směsi a meziodrůdové křížení žita. **(Mixed sowing and intervarietal crossing in rye).**
Sborn. čsl. Acad. zeměd. Věd : Řada rostlinná Výroba 1957 : **30** : 659–70.

The $F_1$ from mixed sowing of equal parts of České [Czech] and Zenit [Zenith] outyielded the standard České and showed improved resistance to shedding at Semčice. The mixture of the two varieties however was more susceptible to lodging than České.

378 Voinov, M. I.
**(Methods for improvement of varietal properties of the winter rye Vjatka).**
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1957 : No. 1 : 26–28. [Russian].

The yield, vigour, and resistance to *Urocystis* *occulta* of Vjatka were improved at the Aleksandrov Breeding Station by intervarietal and intravarietal hybridization. The most noticeable yield increase from intervarietal crossing was when Lisicyn was the pollen parent. But even higher yield increases were obtained by intravarietal crossing involving (*a*) Vjatka of different provenance or (*b*) plants raised from crossing seed harvested in different years.

379 Arriaga, H. O.
El centeno "Insave F.A.", híbrido sintético resistente a la toxemia del "pulgón verde de los cereales." **(The rye Insave FA, a synthetic hybrid resistant to toxemia caused by the green cereal aphid).**
Rev. Fac. Agron. La Plata 1956 : **32** : 191–209.

Inbred lines arising from six rye plants were selected on the basis of resistance to *Schizaphis graminum* and other characters thought desirable in a forage rye, the best lines being further selected for self fertility. In the $S_7$, plants arising from different lines were intercrossed to form a synthetic hybrid, which remained uniform in respect of most of the characters for which selection had been performed; these include resistance to *Puccinia dispersa*, *P. graminis*, *Tilletia* ssp., *Scolecotrichum graminis*, *Helminthosporium* sp., *Claviceps purpurea*, *Erysiphe graminis*, cold, drought and lodging as well as the aphis; although the aphis pierces the leaves they continue to grow without apparent damage. The hybrid tillers well and recovers well after grazing, matures late and has exceeded most other varieties also in yield of grain.

## MAIZE

380 **(Testing Soviet varieties and hybrids of maize in the German Democratic Republic).**
Kukuruza (Maize) 1957 : No. 3 : 59–60. [Russian].

Krasnodar 1/49, Partisan and VIR 25 [Institute of Plant Industry 25] are among the varieties and hybrids recommended for grain and forage in Eastern Germany.

381 Aperçu sur la culture du maïs en Italie et en Suisse. **(An outline of the cultivation of maize in Italy and Switzerland).**
Bull. tech. Ing. Serv. agric. 1957 : No. 119 : 239–54.

This general review includes brief descriptions of maize breeding now in progress. Varieties and hybrids which have been found suitable for certain areas are mentioned.

382 Forsøg med sorter af majs til grønhøstning 1953–1956. **(Trials of varieties of maize for green harvesting, 1953-1956).**
Tidsskr. Frøavl 1957 : **23** : 186–89.

In a continuation of the trial reported earlier [cf. XXVI, 385], the Netherlands varieties Goudster [Golden Star] and Prior (CIV 2) continued to yield well. Foliant, included in the last year, also gave high yields.

383 Bianchi, A.
**A new method of placing inherited factors in maize?**
Genet. agr. 1957 : **7** : 56–60.

After discussing the use of genetic markers, reciprocal translocations and translocations between A and B chromosomes, the author describes a method based on the use of balanced lethals. It is suggested that stocks should be built up, each containing a pair of lethals on a different chromosome, so that on crossing with the mutant under investigation this mutant would be expected to appear in excess in one of the $F_2$ families.

384 Santos, I. S., Everett, H. L. & Aquilizan, F. A.
**Demonstration of limited epistasis in maize.**
Philipp. Agric. 1957 : **40** : 538–43.

The sugary gene, *su*, is epistatic to the waxy gene, *wx*. An iodine test of the pollen grains may be used to determine the genotype with respect to *Wx* vs. *wx*. This method has been found to be 85% accurate when compared with kernel analysis.

385 Clark, E. M.
**A comparison of crossing over in pollen and ovules in translocations involving the short arm of chromosome 9 in maize.**
Diss. Abstr. 1957 : **17** : Publ. No. 20,507 : p. 725.

Using an $F_1$ which was heterozygous for translocation 5–9a involving the *sh–wx* region in the short arm of chromosome 9, considerably higher recombination values had been obtained in previous experiments when the $F_1$ constituted the ♂ parent than when it was employed as ♀ in the reciprocal back crosses. Further investigations have confirmed the higher recombination values in the ♂ for the *sh–wx* region, significant differences between ♂ and ♀ being found only for break points in the region between ·20 to ·46 in the short arm of chromosome 9. For translocations involving the long arm of chromosome 9 no significant differences between ♀ and ♂ were detected, with one exception. Recombination between *sh–bz* and *bz–wx* within the *sh–wx* region reached significantly higher values in the ♂. A four-point study of *sh–wx–pr–*$v_2$ revealed differences between the sexes which approached significance for the *sh–wx*, *sh–*$v_2$ and *wx–*$v_2$ regions. Recombination in the *pr–wx* region was however significantly higher in the ♀ than ♂. No evidence was obtained that differential pollen or ovule viability, gametophytic factors or chromosomal irregularities were responsible for the reciprocal differences in recombination. Nor did length of interstitial segments, the formation of chromatids of unequal length as a result of crossing over in the interstitial segments, and the position of the break in the chromosome 5 bear any relationship to the differences.

386 GREBENŠČIKOV, I.
Über den Heterosiseffekt bei $F_1$-Bastarden verschiedener Maisherkünfte in einem für Mais besonders ungünstigen Jahre. **(The heterosis effect in $F_1$ hybrids of maize of different provenance in a year particularly unfavourable for maize).**
Z. Pflanzenz. 1957 : **37** : 345–74.

Observations were made in 1956 on 93 $F_1$ hybrids and 85 varieties that had served as parents and the full results are presented. The average weight of the hybrid ears was 64·2 g. compared with 42·2 g. for the parents, a statistically significant difference. The hybrids were taller, with a mean height of 161 cm. compared with 147 cm. in the parents; they were also earlier but this difference was not significant. The mean difference between the hybrids and the parent with the higher value was 29·7% for ear weight, 15·4% in time of ripening (the hybrids being later) and 2·04% in plant height; thus there was much more increase in grain yield than in green matter. When hybrids between varieties and between inbred lines obtained by bagging two sister plants were compared, those from the inbreds showed 31·3% more increase in ear weight than those from crossing the varieties.

Of the 52 parents tested in diallel crosses 16 gave improvements in both ear weight and earliness and are classed as having high general combining ability; 6 parents are mentioned as having given over 100% increase in ear weight; of these, 3 were inbreds and 3 open-pollinated varieties; of these 6 good varieties three came from central Germany, in the vicinity of Gatersleben where the experiments were carried out, one each from Denmark and Austria and one from the Caucasus.

There was no strong correlation between the absolute yield of a hybrid and the degree to which it exceeded the higher-yielding parent.

387 BLAŽEVSKIJ, E. V.
**(Our ten years' experiments on cultivating maize).**
Kukuruza (Maize) 1957 : No. 6 : 8–10. [Russian].

Kotovčanka 1 (Leming x Odessa Gruševskaja) was bred on a farm in the province of Odessa. It ripens early, shows resistance to drought and outyields both parents. Mention is made of hybrids between Kotovčanka 1 and Cinquantino or Partisan. The first mentioned hybrid is characterized by improved earliness and drought resistance; the other is highly productive of grain and forage.

388 KALININ, M. S.
**(Promising new hybrids).**
Kukuruza (Maize) 1957 : No. 6 : 26–30. [Russian].

Descriptions are given of some newly bred maize hybrids, in particular the double-cross hybrids VIR267 [Institute of Plant Industry 267] and VIR281, both from the Kuban' station of the Institute of Plant Industry, and the top crosses Bukovina 3 and Dnepr 56, the former from Černovcy and the other from Dnepropetrovsk. VIR267 ripens earlier than the standard VIR37 and outyields it by 5·5 c. per ha. It is resistant to lodging and has a high starch content. VIR281 is drought and lodging resistant and outyields the standard VIR42. Bukovina 3 and Dnepr 56 are earlier than such double-cross hybrids as VIR25 and VIR42 and equal or even surpass them in productiveness. Mention is made of a number of other hybrids which ripen 2-3 weeks earlier than VIR25 and VIR42; these hybrids, still under trial, are regarded as promising grain types for northern districts.

389 SIDOROV, F. F.
**(Interline hybrids of maize selected at the Institute of Plant Industry).**
Bjull. vsesojuzn. Inst. Rasten. (Bull. All-Un. Inst. Pl.-Industr.) 1956 : No. 1 : 14–17. [Russian].

Seven double-cross hybrids, produced from lines obtained partly from local Russian varieties and partly from the USA, are described. The most widely grown is VIR–42 [Institute of Plant Industry 42], a mid-early hybrid distinguished by a certain degree of drought resistance; under irrigation it outyields the standard open-pollinated varieties by 12 c. per ha. and is resistant to smut and lodging.

In areas where VIR–42 fails to mature VIR–25 is grown; it ripens some 5 days earlier and exceeds the open-pollinated varieties by 6–21 c. per ha.; it is resistant to smut and to late spring frosts.

VIR–63, which matures 10–11 days after VIR–42, has exceeded the open-pollinated varieties by 6–17·3 c. per ha. in grain yield and also given high yields of green matter; it also stands well.

The highest yields of all have been given by VIR–156, which exceeds VIR–42 by 3 c. per ha. in grain yield, grows 3 m. high and in yield of green matter has exceeded VIR–42 by 194 c. per ha.; it stands well and is resistant to smut. VIR–50 is mentioned for its aphis resistance and VIR–117 for cold resistance.

All the hybrids have firmly attached ears and are suitable for mechanized harvesting.

390 KOZUBENKO, V. E.
**(Questions of maize breeding).**
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1957 : No. 3 : 40–43. [Russian].

An account of breeding at Černovcy is given, together with descriptions of the intervarietal hybrid Bukovina 1 and the new top crosses Bukovina 2 and Bukovina 3. All these ripen early and are highly productive of grain. For instance, Bukovina 3 outyields the interline hybrid VIR 25 [Institute of Plant Industry 25] by 5% and ripens 5 days earlier. Other topics discussed include selection of male-sterile lines and the development of inbreds from Glorija Janeckogo [Janeckij's Glory], and also from Zubovidnaja 3135 [Dent 3135] which develops 2–3 normal ears per plant. Zubovidnaja 3135 outyields Minnesota 13 Extra from which it was selected for its ear habit.

391 GENČEV, G.
**(Interline hybrids—the latest trend in the production of hybrid maize seed).**
Selskostopan. Misăl 1956 : No. 10 : 587–92. [Bulgarian].

The production of maize inbreds is discussed generally, this work being still in its beginnings in Bulgaria. A number of heterotic hybrids obtained by intervarietal crossing in recent years and also some new high-yielding varieties from Čirpan, Marica and other Bulgarian institutes are listed.

392 KOVAL', A. S.
**(Maize in Bulgaria).**
Kukuruza (Maize) 1957 : No. 4 : 61–62. [Russian].

A reference is made to high-yielding intervarietal hybrids such as A26 x Čirpan which outyield Bulgarian standard varieties.

393 SEN, B.
**Hybrid maize.**
Res. Ser. Indian Counc. agric. Res. 1956 : No. 4 : Pp. 32.

An account of the different types of maize, the development of hybrids, cultivation of the crop and the commercial production of hybrid seed is provided for the benefit of Indian agriculturists. Trials undertaken by the Indian Agricultural Research Institute have demonstrated the superiority in yield of US hybrids over Canadian and Australian. At the Vivekananda Laboratory, Almora, UP, some locally bred hybrids have equalled US hybrids in their ability to give a 95% higher yield than the best UP variety, T41.

394 MELENT'EVA, E. V.
**(The best maize hybrids and varieties under the conditions of Uzbekistan).**
Kukuruza (Maize) 1957 : No. 6 : 31–34. [Russian].

VIR156 [Institute of Plant Industry 156] yielded the most grain and forage in 1955, but in the 1956 trials it was less productive of grain than Mestnaja Samarkandskaja [Local Samarkand], the standard Leming Kubanskij [Kuban' Leming] and the hybrids Imeretinskij and Krasnodar 5. However it had the largest ears and produced more dry matter than all forms except Imeretinskij. Mestnaja Samarkandskaja was selected from Uzbek material; it produced 71·3 c. grain per ha. as against the 67·7 c. of Imeretinskij and its forage yield was just below that of VIR156.

**Report of the fourth annual maize breeders conference of the Union of South Africa, held at Pretoria on 5-8 March, 1956** : Pp. 20 + 3. (Mimeographed).

395 *Hofmeyer, J. D. J. Report on maize breeding at the Agricultural Research Institute, Pretoria. (pp. 1–3).*

Yield and disease resistance have been examined in inbreds selected from Pretoria Potchefstroom Pearl and selection for resistance to *Helminthosporium turcicum*, *Puccinia polysora*, *Gibberella* spp. and other diseases has been carried out.

Stocks containing gene markers and translocations involving all chromosomes are being converted to a locally adapted genetic background.

396 *Stead, B. Station report on maize breeding. College of Agriculture, Potchefstroom. (pp. 3–7).*

Details are given of the performances of new and recently developed white and yellow dent crosses and yellow flint crosses. Male sterility has been incorporated into a number of lines and some double crosses which could be produced without detasselling were tested but were found to possess undesirable grain characters. Highly significant differences in stalk-borer rating were obtained in a trial of three susceptible and four resistant inbreds and all combinations between them. In the case of ear infestations some dominance for resistance was found.

397 *Silva, J. B. Vieira da. Report on maize breeding: Angola. (p. 8).*

The emphasis in maize breeding in Angola has been on the development of synthetics for native use with resistance to *Helminthosporium turcicum* as the basis for selection.

398 *Rattray, A. Report on maize breeding, Salisbury Experiment Station, Southern Rhodesia. (pp. 9–11).*

The need for new lines resistant to *Helminthosporium turcicum* has been emphasized by three successive seasons of severe infestation and breeding with this aim in view has been initiated. New selections have been introduced from Natal, Colombia, Mexico and the USA, including two male-sterile lines from Georgia. Details are given of the performance of some newer varieties and hybrids.

399 *Ellis, R. T. Report on maize breeding. Nyasaland. (pp. 11–14).*

Maize breeding in Nyasaland is directed to the production of synthetic varieties giving higher yields than the native types but retaining their keeping quality. The four synthetics produced in 1954 gave poor yields but the specific combining ability of their component lines was found to be poor and a programme of recurrent selection has been begun. A breeding programme designed to incorporate resistance to *Puccinia polysora* into local inbreds and into an open-pollinated selection for areas with high temperatures is proceeding satisfactorily.

400 *Kühn, C. H. Station report on maize breeding. Bethlehem Research Station. (pp. 14–15).*

Flint types have shown greater promise in this area than dent and emphasis is placed on the production of flint hybrids. SA200 [(A441–5 x A272) x (A337 x A281)] has been released for commercial use and has outyielded yellow Boesman by over 30%.

401 *Bogyo, T. P. Report on maize breeding. Natal Agricultural Research Institute, Pietermaritzburg. (pp. 15–18).*

Details are given of the performance of top crosses and single-cross hybrids at a number of localities in Natal.

402 *Gorter, G. J. M. Report on the disease situation in South Africa. Division of plant pathology. (pp. 18–19).*

The best results in breeding a high-yielding streak-resistant strain have been obtained with the three-way cross (A22 x K63) x (PxH). The Rhodesian streak-resistant lines T4721 and M995 have been used extensively in three-way cross combinations.

403 *Laubscher, F. X. A short note on breeding. (pp. 1–2).*

After discussing overdominance and recurrent reciprocal selection in relation to yield improvement in maize the author recommends the testing of as large a number of varietal crosses as possible in order to investigate differences in crossing ability and degree of dominance effects.

**Report of the fifth annual maize breeders conference of the Union of South Africa, held at Salisbury, Southern Rhodesia, on 25th February to 2nd March, 1957** : Pp. 40. (Mimeographed).

404 *Rattray, A. Station Report. Salisbury Experiment Station. (pp. 2–4).*

Tabulated data are presented showing the increase in acreage and yield of hybrid maize in Southern Rhodesia between 1949 and 1955. A back-crossing programme has been started with a view to incorporating resistance to *Helminthosporium turcicum* from six white and two yellow lines from Natal into A576, which is widely used in the production of hybrids. The conversion to male sterility of N3149, N32–33, RB5254 and PB5522 has successfully reached the third back-cross stage and of these the N3 lines are most suitable as female parents. Streak-resistant N3149 selections obtained by back crossing to P x H were tested on A756 but gave lower yields than N3149 x A756. The results of trials of varieties and hybrids are discussed.

405 *Donovan, P. A. Station Report. Matopos Research Station. (pp. 4–5).*
During 1956 selection was carried out on the basis of agronomic characters and disease resistance and outcrosses of white lines to Potchefstroom Pearl and yellow lines to Sahara were selected for drought resistance. Mass selection in 11 varieties is in progress.

406 *Converse, C. D. Station Report. Sabi Valley Experiment Station. (pp. 5–6).*
Inbreeding in four varieties has been in progress for some years and combining ability tests are now under way with a view to the eventual production of single crosses. The breeding of a short, sturdy, nontillering and lodging-resistant strain is also in progress, together with selection and breeding for disease resistance and suitability for late planting.

407 *Ellis, R. T. Station Report. Lilongwe, Nyasaland. (pp. 6–8).*
Inbreeding of native maize for the eventual production of synthetics has now reached the $S_8$ generation but some segregation for height, maturity and grain type is still occurring. Single crosses including introduced lines have been tested but those involving Mexican lines were very susceptible to *Helminthosporium turcicum* although giving high yields of desirable ears.

408 *Harrison, M. A. Station Report. Kenya. (pp. 8–10).*
A brief history of maize breeding in East Africa is given, together with a progress report on breeding for resistance to *Puccinia polysora*.

409 *Silva, J. B. Vieira da. Station Report. Angola. (p. 11).*
Work in progress includes the production of hybrids and synthetics from local and imported material possessing resistance to *Helminthosporium turcicum*, the development of a flint strain for weevil resistance and the production of a yellow synthetic with greater drought and disease resistance for the northern zone.

410 *Bogyo, T. P. Station Report. Natal Agricultural Research Institute. (pp. 11–14).*
Selection for drought resistance and trials of recent top crosses and hybrids have been carried out. Only two out of 23 lines from a back cross involving K64 showed satisfactory resistance to *Helminthosporium turcicum*. They have now been pooled and bulked for further increase and Texas male sterility is being incorporated by back crossing. Further breeding of white and yellow lines has been carried out, one of the most promising crosses being Teko x Natal Yellow Horsetooth, which significantly outyielded almost all other entries. A number of white and yellow lines have been tested at Beltsville, Md., for resistance to *H. turcicum*.

411 *van Schaik, T. Station Report. Transvaal Agricultural Research Institute, Pretoria. (pp. 14–15).*
Trials of inbreds and hybrids have been carried out and further progress has been made in the evaluation of inbred lines.

412 *Kühn, H. C. & Dykhuis, F. J. Station Report. Bethlehem Agricultural Research Station. (pp. 15–17).*
The results of trials of single and double crosses in yellow and white dent and flint material are discussed.

413 *Stead, B. & Kühn, H. C. Station Report. Potchefstroom. (pp. 17–20).*
The performance of recently developed hybrids in the 1955–56 season is discussed. None of the ten double crosses produced using male sterility with full fertility restoration significantly outyielded the standard hybrids. It is now possible to produce the promising hybrid P3158 by this method. The conversion to male sterility of 32 of the best inbreds is in progress, more satisfactory results being obtained with the Texas source than with the Ky27ms source.

414 *Leaf diseases of maize in Southern Rhodesia. (pp. 23–25).*
The evaluation of local and introduced lines for resistance to *Helminthosporium turcicum* has continued at Salisbury, the most promising material being found among lines from Natal and Central America. In many cases the resistance shown in the original environment of a line is not realized at Salisbury but the reason for this is not yet known. Of the 700 lines tested for their reaction to *Puccinia polysora* only a few from Central America and Mexico showed resistance.

415 *Kerr, W. E. Testing maize hybrids for ear rots in Southern Rhodesia. (pp. 25–28).*
Methods of testing maize for reaction to various ear-rotting fungi are discussed. It has been shown that differences in susceptibility to *Diplodia zeae* can only be detected if inoculation is carried out at the full silk stage and that these differences disappear as the ears mature.

416 *Gorter, G. J. M. A. Breeding for streak resistant maize. (p. 28).*
Top crosses and three-way crosses of 22 local and seven Rhodesian lines on P x H have been tested at Pretoria under conditions of severe

streak infection. Possible new sources of streak resistance have been found in maize lines from Mexico and recombined synthetics of P x H are under trial.

417 *Le Roux, P. M. Disease testing by Transvaal Agricultural Research Institute. (p. 29).*

Testing has been carried out for reaction to *Sphacelotheca reiliana, Helminthosporium turcicum* and *Puccinia sorghi.*

418 *Arnott, R. A. The production of foundation stocks in Rhodesia. (pp. 32–33).*

The method used for the production of single crosses is described.

419 *Nicolle, P. E. N. The commercial hybrid situation. Rhodesia. (pp. 33–34).*

The work of the Rhodesian Seed Maize Association in supervising the production of hybrid seed is outlined.

420 *Ravenscroft, C. S. I. South Africa. (pp. 34–37).*

Details are given of the production of hybrid maize seed in South Africa.

421 *Robinson, P. Biometry in plant breeding. (p. 37.) (Abst.).*

After outlining the use of incomplete block designs for the evaluation of large numbers of entries from breeding experiments and the application of discriminant functions in selection experiments the author concludes that the use of a discriminant function is complicated and of little practical value.

422 *Sellschop, J. Preservation of germplasm. (p. 38).*

A list is given of the collection of 31 seed and ear samples of maize varieties from one or more sources at the Potchefstroom College of Agriculture.

**Proceedings of the Second Annual Conference of the Professional Officers of the Department of Research and Specialist Services of the Federal Ministry of Agriculture, Rhodesia and Nyasaland, held at Gwebi Agricultural College, 19th and 20th March, 1956** : Pp. 95.

423 *Kerr, W. E. Ear and cob rots of maize. (pp. 15–20).*

Methods of testing resistance to these diseases are discussed. Tabulated results are presented for tests held during 1950–55 in Southern Rhodesia on the resistance of some open-pollinated varieties, inbred lines and single hybrids to *Diplodia zeae, Fusarium graminearum* (*Gibberella zeae*), two races of *F. moniliforme* (*G. fujikuroi*), and *F. moniliforme* var. *subglutinans.* Of the varieties, Salisbury White was found most resistant to all these pathogens. The single hybrids 51H5 (K4222 x M995) and 51H6 (K4222 x N2656) showed a consistent high level of resistance. The resistant strains tended to have the ear tips well covered.

424 *Herd, G. W. Leaf diseases of maize in S. Rhodesia. (pp. 21–25).*

Testing for resistance to *Helminthosporium turcicum* and *Puccinia polysora* has continued with local and imported material. Of the inbred lines tested, N3–2–3–2 was found to have a high degree of resistance, which was transmitted to the single crosses 51H39(N3–2–3–3 x M9–9–5) and 51H37(N3–2–3–3 x A5–7–6). The following Sabi inbred lines appeared to be resistant to streak virus: KO5, NA, NB, K11 and KV1–1. These lines are to be further tested.

425 *Robinson, P. Is hybrid maize improving maize production in S. Rhodesia. (pp. 26–27).*

Data were examined on the yield from crops harvested during 1945–54. When corrections were made for differences in rainfall, no marked increase in yield corresponding to the introduction of hybrid maize was found.

426 *Rattray, A. Maize breeding. (pp. 48–52).* This review deals briefly with early attempts at maize improvement and describes modern methods of breeding hybrid maize.

427 *Donovan, P. A. Maize investigations at Matopos Research Station. (pp. 68–69).*

Varietal trials indicated that Golden Beauty, Sahara and Kroonstad Robyn yield as well as the White Salisbury hybrids, Potchefstroom Pearl and Early Pearl. Breeding has begun with a number of introduced varieties, strains and inbred lines.

428 *Thomas, P. E. L. Maize investigations on the Sabi Valley Experiment Station. (pp. 70–72).*

Varietal trials indicated that yellow open-pollinated varieties are superior in yield to other open-pollinated varieties. High-yielding yellow hybrids suitable for the irrigated lowveld will soon be available.

429 *Fielding, W. L. Maize investigations at Gwebi Agricultural College. (pp. 73–75).*

Hybrids were found to give considerably higher yields than open-pollinated varieties.

430 *West, O. Maize investigations at Grasslands Research Station. (pp. 78–84).*

Comparisons made in 1953–4 and 1954–5 indicated that Salisbury hybrids are superior to various open-pollinated varieties in yield, response to nitrogen and tolerance of close planting. Tabulated data are given of the main varietal differences.

431 *Rattray, A. Maize investigations at the Agricultural Experiment Station, Salisbury. (pp. 90–95).*

The influence of the date of planting on yield has been investigated for a number of varieties. Delayed planting caused a smaller decrease in yield with the quick-maturing hybrid 49DH32 than with the slow-maturing 49DH16.

432 Dimmock, F.
**Hybrid corn. Further improvement sought using different avenues of approach.**
Res. Frmrs., Ottawa 1957 : **2** : No. 3 : 10–11.

The methods used in the production of hybrid corn are described in this popular article, particular emphasis being laid on the use of cytoplasmic male sterility.

433 Jenkins, M. T. (Editor)
**Minutes of the meeting of the North Central Corn Breeding Research Committee 1957.**
Crops Res. Div., Pl. Industr. Sta., Beltsville, Md. 1957 : Pp. 70.

In reporting the results of tests of AES hybrids, tabulated data are provided on the yield, moisture percentage, root and stalk lodging, shelling percentage and borer rating of a total of 105 maize hybrids, belonging to nine maturity groups, tested in seven states in 1956. For some of the groups additional data are included on dropped ears, ear height, bird injury, smutted plants, leaf blight incidence and husk cover score. The pedigrees of the hybrids are given. The Report of the Sub-committee on the Preservation of Germ Plasm mentions the following details: the Michigan Station is maintaining 32 open pollinated strains, the Illinois Station 145 inbred lines and the Missouri Station has added three of its own open pollinated varieties and 16 from South Africa to its collection. A revised list of important inbred lines is presented by the Sub-committee on the Grouping of Inbred Lines while the Sub-committee on Cytoplasmic Male Sterility and Restorers discusses standards for the use of recovered restorer inbreds. N. P. Neal discusses the need for establishing a uniform system of maturity designations and mentions some of the factors influencing the time taken by a variety to reach maturity. A list is included of inbred maize lines released between 1946 and 1955 together with details of their use in the production of hybrid seed. The Reports of the Sub-committees on Uniform Tests of crosses and inbreds of various maturity groups include tabulated data, as detailed above, for nine inbreds and 116 crosses.

H. H. Kramer and R. L. Whistler describe studies at Purdue University, Lafayette, Ind., on the interaction of genes which affect the amylose-amylopectin ratio. A number of the possible combinations involving five genes, namely *du* on chromosome X, *ha* on chromosome V, *su* on chromosome IV, $su_2$ on chromosome VI and *wx* on chromosome IV have now been synthesized and data on the phenotype, amylose percentage and birefringence end point of these genotypes are tabulated. Birefringence end-point temperatures were found to be consistent; in the case of the single gene stocks, $su_2$ is low, *du*, *su* and *wx* are normal and *ha* is high while when two genes are present $su_2$ brings *du* and *wx* down to the $su_2$ level, *du* and *wx* bring *ha* down to the normal level and *ha* brings *su* up to the *ha* level and $su_2$ up to the normal level. High values for amylose content are controlled by two separate systems, one involving *ha* and the other resulting from the interaction of *su*, $su_2$ and *du*. No increase of amylose content is obtained by combining genes from the two systems and in some combinations a decrease is produced. In Breeding high amylose starch, M. S. Zuber and C. O. Grogan report the results of experiments carried out in Missouri with $ha_1$ (= *ha*) and $ha_2$ (= $ha_m$122 and $ha_m$123) high amylose stocks and $F_1$, $F_2$ and $F_3$ progeny of crosses between them. Evidence is presented from which the following conclusions are reached: (1) that the two factors are not allelic, (2) that it is possible to classify $F_2$ kernels for high amylose content on phenotypic characters, (3) that the two factors are not completely additive and (4) that some inbreds possess modifying genes which increase the amylose content above that of $ha_1$ stocks but not of $ha_2$ stocks. E. H. Coe, in Genetic studies on factors for high-amylose starch, reports the finding of an interaction of $ha_1$ and $ha_2$ with *wx* resulting in *ha wx* kernels showing marked collapse and usually also translucence and a second between $ha_2$ and *su*, $ha_2$ *su* kernels being less wrinkled than *Ha su*. It has been confirmed that $ha_1$ is located on chromosome V and $ha_2$ on chromosome X. The current status of the Nebraska program on recurrent selection is discussed by T. H. Lonnquist, tabulated data being included on the performance of parents and progeny after one or two cycles of improvement and of synthetics from the different testers. A final table shows estimates of additive genetic variance components in Krug before and after two cycles of recurrent selection for general combining ability. In Dwarf corn hybrids, E. R. Leng described the production of dwarf inbreds by the incorporation of brachytic 2 into standard inbreds and the use of these inbreds to produce double cross dwarf hybrids. Four such hybrids tested at Urbana, Ill., yielded about 20% less than the average of two normal hybrids but at Brownston the yields of both types were almost the same. The chief advantage of the dwarf hybrids is their almost complete resistance to lodging while possible disadvantages are lower yields under favourable conditions and sensitivity to crowding. The use of the LSD in F tests is discussed by G. F. Sprague in Current Status of the LSD and G. H. Stringfield discusses Adjusting field plots to their adjacent and distributed controls. J. B. Beckett, in Male sterility and restorer genes, presents evidence for the action of two complementary dominant genes in the introduction of restorer genes into WF9, in the presence of Texas sterile cytoplasm, and for the action of one additional restorer gene and additional modifying genes in other inbreds. When K64 was used as the original source of restoration WF9 appeared to require only one additional gene for fertility while using M14 as restorer line gave inconsistent results which have not yet been interpreted. Finally in Studies on the inheritance of resistance to corn leaf rust W. A. Russel and A. L. Hooker report the following results of work carried out at the Iowa State College since 1953: (1) 68 maize lines were found to show protoplasmic resistance to one or more of 59 isolates of *Puccinia sorghi*, (2) inbred B38 is resistant to 39 of the 44 cultures with which it was tested, K148 is resistant to 37 of these cultures, Cuzco is resistant to 59 cultures and GG208 to 43 out of 44 and (3) resistance is dominant in 44 maize lines and recessive in ten. Studies of $F_2$ and backcross progenies suggest the existence of three types of gene interaction: (1) one factor pair with resistance being dominant, (2) one factor pair with resistance being recessive and (3) two factor pairs with resistance recessive in both cases, and further that resistance in B38, K148, GG208 and Cuzco is due to the same gene pair and that these genes form an allelic series with two or three others from other sources. The action of some of the recessive genes is influenced by temperature. At least 18 races of *P. sorghi* have been identified and a series of sublines of B14 are being established by back crossing to act as differential varieties.

434 **Synthetic corn varieties, two-eared plants may find a place in Nebraska.**
Neb. Exp. Sta. Quart. 1957 : **4** : No. **4** : 13, 16.

Synthetic varieties have been found to give yields comparable to those obtained from hybrids. They are more variable than hybrids and are less vulnerable to extreme conditions. It has been suggested that two-eared varieties would be more suitable than one-eared varieties for dry areas.

435 Bocanegra S., S.
Adelantos en el programa de maíz de la Estación Experimental Agrícola "La Molina". Campaña 1955–56. (**Progress in the maize programme of the La Molina Agricultural Experiment Station. Season 1955-56**).
Inf. mens. Estac. exp. agríc. La Molina 1957 : **31** : No. 359 : Pp. 63. (Mimeographed).

Some 60 lines have been selected as combining good habit, ear form, yellow flint grain and freedom from disease. Some lines from Mexico and Colombia also appear promising and use is being made of male-sterile lines and popcorns from the USA. Hybrids La Molina 2 and 3 have given yields of 4500 and 5500 kg. per ha. respectively, which is far in excess of that from the best local varieties of Peru. Certain other hybrids have yielded up to 6800 kg. per ha. Data on the yields of 36 single-cross hybrids show lines 1, 3, 6, 8 and 11 to have the best combining ability and a number of double crosses are being made on the basis of these results.

436 Grant, U. J., Ramírez E., R., Astrálaga R., R., Cassalett D., C. & Torregroza C., M.
Cómo aumentar la producción de maíz en Colombia. (**How to increase the yield of maize in Colombia**).
Bol. Divulg. Minist. Agric., Colombia 1957 : No. 1 : Pp. 51.

These general instructions for maize growing in Colombia include advice as to the best varieties and hybrids to grow in the six different climatic zones of the country. Comparative yield data for three years are presented, showing that the improved variety Eto exceeded the local variety Amagaceño in yield by 31%; it was itself surpassed by 15% by hybrid Diacol H–203, which was in turn exceeded by 5% by hybrid Diacol H–251.

437 Keuls, M. & Wiskunde, L. H. S.
Het gebruik van de variantie-analyse bij het opsporen van de beste combinaties van ouders in de maisveredeling. **(The use of variance analysis in detecting the best combination of parents in maize breeding).**
StudKring. PlantVeredel., Wageningen Versl. 1956 : **51** : 707–31. (Mimeographed).

An iterative method, based in part on the results of normal analysis of variance, of calculating general combining ability in cases where only some of the possible hybrids between the parents are available is described, the example used being a trial laid out as a $3^5$ lattice design in which 132 hybrids, some of them duplicates, from 21 inbred parents were included.

438 McMeekin, A. L.
**Effect of pattern, population and fertilization on the performance of five corn hybrids.**
Diss. Abstr. 1956 : **16** : Publ. No. 18,477 : 1767–68.

Investigations were carried out at Rutgers University, N.J., on the effects of density, method of planting and manuring on the behaviour of the maize hybrids NJ7, NJ8, Penn.807, Conn.554 and the single cross C103 x 38–11 with respect to (1) number of days to silking, (2) ear and stalk heights, (3) stalk rot, (4) broken plants, (5) grain moisture, (6) grain yield, (7) dry matter in the grain and (8) protein. It was concluded that the influence of the above three conditions varied according to the genetic constitution of the hybrids; no detailed information is however given on the effect of genotype.

439 Efimov, M. I.
**(Maize varieties and hybrids for cultivation on irrigated land in southern Kazahstan).**
Kukuruza (Maize) 1957 : No. 5 : 35–36. [Russian].

Data showing the growth periods and yields for a number of varieties and hybrids at the Krasnovodopadskaja Breeding Station are presented. Hybrids Krasnodar 4, Bukovina 3 and the double-cross hybrids VIR 42 [Institute of Plant Industry 42], VIR 50, VIR 264 and VIR 269 yielded the most grain and among these VIR 50 and Krasnodar 4, with respective growth periods of 99 and 101 days, were also productive of forage.

440 **(The USSR conference on the production of hybrid maize seed).**
Kukuruza (Maize) 1957 : No. 4 : 18–29. [Russian].

This report on a conference at Odessa mentions new hybrids distinguished mainly by earliness, drought resistance and high yield. These include Dnepr 56, from the USSR Maize Institute, and VIR 281 [Institute of Plant Industry 281], a double-cross hybrid.

441 Jones, D. F.
**Gene action in heterosis.**
Genetics 1957 : **42** : 93–103.

Part of the investigations described deals with a recessive degenerative mutant of maize termed pale crooked, distinguished by pale-green leaves at the tops of the plants during the early stages of growth and by crooked stalks. The pale crooked mutant recovered from the cross of the original mutant with its normal progenitor and the $F_1$ cross between original and recovered mutants were both significantly taller than the original mutant. The $F_1$ cross of the original normal line and original mutant showed the same increase (6%) in height over the original normal line as that reported in a previous paper [XVI, 752]. The recovered normal line and the $F_1$s of recovered normal x recovered mutant and original normal x recovered normal had heights approximately similar to that of the $F_1$ of original normal x original mutant.

A comparison of back-crossed lines homozygous and heterozygous for a recessive marker was also made. The marker pairs used were *Yy* (yellow *vs.* white endosperm), *Pp* (red *vs.* white cob) and *Glgl* (normal *vs.* glossy seedlings); they were assumed to have no effect on growth and productivity. Heterozygous back crosses did not differ significantly in height from homozygous recessive back crosses but both types of back crosses were taller than the corresponding recessive inbreds used as recurrent parents.

No evidence of overdominance was therefore obtained for the two types of genes tested. No satisfactory explanation of the results could be offered.

442 Bianchi, A.
**Defective caryopsis factors from maize-teosinte derivatives. 1.—Origin, description and segregation.**
Genet. agr. 1957 : **7** : 1–38.

A total of 29 defective endosperm mutants, designated $de^{t1}$ to $de^{t29}$ are described and details given of their origin. Preliminary results indicate that several of the mutants are genetically different and it is suggested that they may result from the introduction of teosinte chromosomes into maize. Most of the mutants appeared in the first selfed generation after the $F_1$ hybrid had been back crossed to maize. Anomalous segregation was observed for many of the mutants and in some cases is known to be due to their instability, to interaction with their genetic background or to differential fertilization. Cytological studies failed to show any constant association between the defective mutants and chromosome aberrations. Tabulated data on the segregation of 14 of the mutants are provided in an appendix.

443 GALEEV, G. S. & SIDOROV, F. F.
**(Study of a collection of inbred lines of maize from the standpoint of breeding).**
Bjull. vsesojuzn. Inst. Rasten. (Bull. All-Un. Inst. Pl.-Industr.) 1956 : No. 2 : 3–13. [Russian].

Some 200 inbred lines were examined and classified in respect of time of maturity, grain yield, smut and drought resistance, standing capacity, toughness of ear and stem and rhythm of development; in some lines the period from flowering to ripening was relatively short and in others it was long, both of these types being of interest for different purposes. Observations were also made on pollen production and on combining ability; the majority of the early-maturing lines had low combining ability and a search is being made for some that are better in this respect.

444 **Tennessee releases several inbred lines of corn.**
What's New Crops Soils 1957 : **9** : No. 9 : p. 44.

T8 is a hard yellow dent derived from Jarvis Prolific. T13, T18 and T61 are white dents derived from Neal Paymaster. These four lines are used in producing Tennessee 10. T61 x T13 is used as the seed parent in Dixie 17 and Dixie 33.

445 BRAWN, R. I.
**Effect of the $P^{VV}$ allele in homozygous and heterozygous condition on mutations to red and to light variegated pericarp in maize.**
Diss. Abstr. 1956 : **16** : Publ. No. 18,382 : 1778–79.

$P^{vv}$ (= $P^{rr}Mp$) was incorporated into the yellow dent inbreds W22 and W23 carrying $P^{wr}$ for colourless pericarp and red cob [cf. XXVII, 1725]. Back-cross plants with the genotype $P^{vv}/P^{wr}$ were selfed so as to obtain $P^{vv}/P^{vv}$ and $P^{vv}P^{wr}$ individuals which were then pollinated by a stock carrying $P^{ww}$ for colourless pericarp and colourless cob. In the W23 series, mutation to $P^{rr}$ (10·14%) for red pericarp was about twice as frequent, per $P^{vv}$ allele, in the progeny of $(P^{vv} \times P^{wr}) \times P^{ww}$ as in the progeny of $(P^{vv} \times P^{vv}) \times P^{ww}$. A similar relationship was found in the case of mutation to light variegated ($P^{vv}$ + transposed *Mp*). The frequency of this mutation per $P^{vv}$ allele was about twice as high in the offspring of the heterozygotes as in the offspring of the homozygotes. The $P^{vv}$ allele underwent a markedly lower rate of mutation to red or light-variegated pericarp in the W22 series than in the W23 series, the frequencies of mutation to red and light variegated being the same (about 2%) per $P^{vv}$ allele in the progenies of the homozygotes and heterozygotes. Mutations of $P^{vv}$ to "very light variegated", "orange variegated" and $P^{ww}$ also occurred in the progenies of both homozygotes and heterozygotes.

The results support the hypothesis of previous investigators that loss of *Mp* from locus *P* is due to its transposition to another site. Since the frequency of mutation to light variegated paralleled that of mutation to red in both the W22 and W23 series, the *Mp* component whose loss from $P^{vv}$ gives $P^{rr}$ therefore appears to be transposed in a nonrandom fashion, being nearly always included in the unchanged $P^{vv}$ chromosome.

446 VAN SCHAIK, N. W.
**Transpositions of modulator, a modifier of variegated pericarp in maize.**
Diss. Abstr. 1957 : **17** : Publ. No. 20,652 : p. 728.

A study was made of the positions of *Mp* after transposition from the locus *P* [cf. XXVII, 1725]. Transposed *Mp* (*tr–Mp*) was found to occupy a variety of positions. It was located on chromosome 1, in some cases linked with locus *P*. Linkage was also detected between *tr–Mp* and reciprocal translocations marking chromosomes 4 and 5, and 5 and 9. In a series of independently occurring mutations to light variegated, *tr–Mp* was linked with *P* in 64% of cases, a figure considerably higher than that which would have been obtained if *Mp* had undergone transposition at random. The frequency with which *tr–Mp* occupied any given position on chromosome 1 increased sharply as the distance from locus *P* decreased. *Mp*, after being freed from *P*, often underwent further transposition. Limited data suggested that *tr–Mp* is less likely to be secondarily transposed if the position first held is close to *P*.

447 NELSON, O. E. (JUN.) & OHLROGGE, A. J.
**Differential responses to population pressures by normal and dwarf lines of maize.**
Science 1957 : **125** : p. 1200.

Stocks of the inbred Hy respectively carrying *ct*, *rd* and *br*2 for the semidwarf conditions termed compact, reduced and brachytic 2 were developed at the Department of Agronomy, Purdue University, Ind. Compared with the normal inbred Hy for three years, the *ct* inbred has shown a superiority in yield at high densities. Inbred *rd* has been tested for 2 years and *br*2 for 1 year. The *ct* type was superior to both the other mutants. Like strain *ct*, *rd* was superior to the normal inbred at each density except 13,000 plants per acre; strain *br*2 was inferior at all densities. Preliminary tests suggest that inbreds and hybrids containing the same gene (*rd* or *br*2) for dwarfing show a similar pattern of response to density. Tests of hybrids partially converted to *ct* are to be carried out in 1957.

448 CURME, J. H.
**Some waxy mutations in maize and their effects on starch properties.**
Iowa St. Coll. J. Sci. 1957 : **31** : p. 386. (Abst.)

A range of mutants from normal waxy to normal starchy was investigated and in a study of the progeny of all possible reciprocal crosses the effect of the female parent, in respect of some of the physical properties of endosperm starch pastes and gels, was found to be greater than that of the male parent. It is concluded that "the characteristics of starch granule types conditioned the differences in gene dosage sample measurements" and that "the different mutant types may effect specific properties of the starch pastes and gels."

449 KONZAK, C. F.
**The influence of oxygen on the mutagenic effects of X-rays on maize endosperm loci.**
Radiation Res. 1957 : **6** : 1–10.

Tabulated data are provided on the mutant endosperm classes observed after X-ray treatment of pollen carrying *C*, *Sh* and *Wx* in oxygen, air or nitrogen. In all cases the number of mutants was greater when X irradiation was carried out in air or oxygen than in nitrogen. Evidence was obtained indicating that specific chromosomal regions may respond differently, depending on the atmosphere during irradiation [cf. XXIII, 302].

450 Nueva variedad de maíz. **(A new variety of maize).**
Agricultor venezol. 1955 : **19** : No. 178 : p. 7.

The yield per ha. of the variety Sicarigua mejorado [Improved Sicarigua] developed by the Ministry of Agriculture and Livestock, Venezuela, is four times as great as the mean yield per ha. of all varieties grown in the country. Its chief characteristics are high numbers of ears per ha. and low numbers of lodged, weak or earless plants.

451 GERRISH, E. E.
**Studies of the monoploid method of producing homozygous diploids in *Zea mays*.**
Diss. Abstr. 1956 : **16** : Publ. No. 18,927 : 2285–86.

Production of monoploids in crosses of 19 single hybrids and 2 top crosses with 6 ♂ marker stocks was investigated. Monoploids were detected by screening the dry seeds for lack of anthocyanin pigmentation in the scutellum, plumule and root, followed by further screening of the seedlings and older plants. The overall frequency of monoploids was 0·76 per 1000 seeds and seedlings. Among ♀ parents the frequency of monoploids ranged from 0·13 to 2·22 per 1000. The multiple dominant marker stocks *aBPlCRspu* and *ABPlCRSPu* differed in ability to stimulate monoploidy, the frequency being 0·40 for the former and 0·20 per 100 for the latter. Delay in pollination increased the number of monoploids in 7 out of the 8 single crosses tested, particularly in Oh43 x A240. As indicated by tassel fertility, application of colchicine enhanced the frequency of 2*n* sectors in monoploids. The frequency of 2*n* sectors was influenced to a greater extent by the concentration of colchicine than by the means of application, sectors being most frequent at a concentration of 0·025%. The yields obtained from top crosses of 4 doubled monoploids and two maternal diploids provided no evidence that homozygous diploids will tend to be superior to inbreds.

452 OBERDORF, F. & MÜLLER, H. W.
Beiträge zur Maiszüchtung. I. Das Fahnenschieben, ein wichtiges Merkmal zur Beurteilung der Anbauwürdigkeit von Maissorten und -hybriden. **(Contributions to maize breeding. I. Tasselling, an important character for the assessment of suitability for cultivation of maize varieties and hybrids).**
Züchter 1957 : **27** : 239–44.

It is suggested that for purposes of international exchange of material the normal classification according to maturity, i.e. early, midearly, late etc., which in any one variety varies according to country, should be replaced by a scale of values from 100–1000 depending on date of tasselling and based on an international series of standards. In tests carried out at Bernburg, Germany, a high positive correlation was obtained between tasselling date and moisture content of the grain at harvest. Plant height was not significantly related to tasselling date. A table showing the relative maturities of numerous German and introduced varieties according to the proposed scale is included.

453 ERLEPESOV, M. & POTAPOVA, N.
**(At a research station).**
Kukuruza (Maize) 1957 : No. **4** : 57–58. [Russian].

Breeding work with maize at Alma-Ata is discussed. Worth mention are male-sterile lines found among the inbreds of Bukovina 3, North Dakota and Stalingrad and also inbred lines, selected from Uzbek material, in which the tassel remains enveloped in the leaf sheath at flowering.

454 HADŽINOV, M. I.
**(The breeding of maize inbreds with male-sterile pollen and of pollen-restoring lines).**
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1957 : No. **1** : 8–13. [Russian].

An account of the development of male-sterile and pollen-restoring lines at Krasnodar is given. It was found that male-sterile material from Moldavia and Texas differed in the percentages of sterile, semisterile or fertile plants that they gave on crossing to Soviet inbreds. For instance, the Moldavian male-sterile source imparted male sterility to all the progeny of VIR44 [Institute of Plant Industry 44] while crossing with the Texas source gave one semisterile plant, the rest being male-fertile.

455 JONES, D. F., STINSON, H. T. (JUN.) & KHOO, U.
**Transmissible variations in the cytoplasm within species of higher plants.**
Proc. Nat. Acad. Sci. USA 1957 : **43** : 598–602.

This discussion is chiefly concerned with cytoplasmic conditions affecting pollen production in maize. Differences in free aminoacid contents between normal anthers and those containing the T type of sterile cytoplasm have been recognized by chromatographic analysis [cf. 456]. Although the expression of a cytoplasmic condition such as the T type is subject to genetic control, the actual condition is not permanently altered by the genic environment. Pollen-restorer genes apparently act through the sporophyte by suppressing the effects of cytoplasm causing sterility.

456 KHOO, U. & STINSON, H. T.
**Free aminoacid differences between cytoplasmic male sterile and normal fertile anthers.**
Proc. Nat. Acad. Sci. USA 1957 : **43** : 603–07.

Chromatographic analysis of normal fertile anthers in maize and of anthers causing the T type of cytoplasmically inherited male sterility revealed that in sterile anthers a precocious accumulation of alanine occurred in the spore quartets, becoming most marked as the anthers passed through the old-microspore stage; at the pollen-grain stage fertile and sterile anthers showed no differences in alanine accumulation. This precocity preceded any morphological signs of degeneration. At the old-microspore stage, sterile anthers showed two other ninhydrin-positive spots which were absent or much less intense in the chromatograms of fertile anthers; one spot was identified as asparagine. At still later stages (4–5 days prior to anthesis in the normal anther and also subsequently) large quantities of proline were characteristic of the fertile anthers but sterile ones lacked this substance. The A, B and S types of cytoplasmic sterility were not associated with precocious alanine accumulation.

457 WOLFE, M. & FOWDEN, L.
**Composition of the protein of whole maize seeds.**
Cereal Chem. 1957 : **34** : 286–95.

Complete analysis of the aminoacid composition of the protein of seeds of seven varieties from Uganda revealed considerable varietal differences in composition, the largest differences being found in respect of arginine, histidine, lysine, leucine, threonine, valine and amide nitrogen. The differences were not due to disparities in the proportion of zein and they were greatest between distantly related varieties.

458 GENTER, C. F., EHEART, J. F. & LINKOUS, W. N.
**Oil and protein relationships between inbred lines and their single cross progeny.**
Agron. J. 1957 : **49** : 283–85.

Correlation coefficients between inbreds of maize and their single crosses in respect of the oil and protein contents of the grain indicated that little dominance is expressed in the inheritance of these constituents. The data also showed that the oil and protein contents of single crosses may be predicted with considerable accuracy from the parental means.

459 FOWDEN, L. & WOLFE, M.
**The protein composition of some East African seeds.**
E. Afr. agric. J. 1957 : **22** : 207–12.

The seeds analysed are those of seven maize varieties, one sunflower and one cotton variety from Uganda. Tabulated data are included showing the nitrogen and protein contents of the seeds and the amount of each of 19 amino-acids. The largest differences of total nitrogen and protein were found not between the three main maize types, K8, Ubi and Muretha, but between three colour types of K8 grain. Since the grains examined came from the same cob it is concluded that the differences are of genetic origin and not the result of differences in nutrient supply to the developing grain.

460 FUWA, H.
**Phosphorylase and Q-enzyme in developing maize kernels.**
Arch. Biochem. Biophys. 1957 : **70** : 157–68.

*Wx Wx* and *wx wx* kernels did not differ in respect of ratio of phosphorylase to Q enzyme throughout the period tested (12–25 days after pollination). Only a trace of permanent amylose was however produced in the *wx wx* type whereas *Wx Wx* kernels had an amylose fraction of about 30%. The possible nature of the enzymic difference between starchy and waxy maize is discussed.

461 BLANCO GONZÁLEZ, M., BLANCO GONZÁLEZ, J. L. & VEIGUINHA, A. S.
Obtención de híbridos de maíz de tallo azucarado, de doble aprovechamiento—grano y planta—y estudio comparativo de su valor industrial, agrícola y económico. **(The production of sweet-stemmed maize hybrids for dual use—as grain and plant—and a comparative study of their industrial, agricultural and economic value).**
Genet. iber. 1957 : **9** : 1–101.

Details are given of the work carried out during 1951–55 [cf. XXVI, 2317 and XXVII, 2935]. The best hybrids obtained were superior in yield both of grain and, after grain maturity, of leaves and juice solids to standard commercial hybrids, and were further characterized by high grain protein. After harvesting the grain, the plants may be used for ensilage or the stalk juice for alcohol.

**Conference on radioactive isotopes in agriculture held at East Lansing, Michigan, January 12, 13, 14, 1956 :**
Pp. 27.

462 *Caldwell, A. C., Hustrulid, A. & Rinke, E. H. Phosphorus absorption from radioactive phosphate fertilizer by a number of inbred lines and single crosses of corn. (pp. 7–8).*

The fertilizer was applied for three years to a large number of maize inbreds. Certain lines were found consistently to use more phosphorus and these were mostly early maturing types.

463 KORNILOV, A. A.
**(A method of breeding maize for hardiness).**
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1957 : No. 2 : 3–7. [Russian].

Experiments at Karaganda on hardening varieties by growing them in an unheated glasshouse and then subjecting them at the 2–4 leaf stage to — 4° C. for 4 hr. are discussed in relation to the selection and breeding of new hardy forms.

464 JUDIN, V. F.
**(The results of testing maize varieties in the central Urals).**
Kukuruza (Maize) 1957 : No. 2 : 49–51. [Russian].

Caucasian and South American material which ripens 3–7 days earlier than Pervenec [First-born] and other Siberian varieties was selected at the Sverdlovsk Branch of the Institute of Plant Industry. Forms 4957 and 4958, originating from Chile, are drought resistant and have a habit suitable for combine harvesting. Data on forage yields of varieties with different maturity dates are given and observations are made on cold resistance of the seed of varieties from the collection of the Institute of Plant Industry. Varieties moderate in their soil-temperature requirements originating from the Netherlands, Poland and Czechoslovakia are mentioned.

465 ZUBER, M. S., GROGAN, C. O., MICHAELSON, M. E., GEHRKE, C. W. & MONGE, F. F.
**Studies of the interrelation of field stalk lodging, two stalk rotting fungi, and chemical composition of corn.**
Agron. J. 1957 : **49** : 328–31.

In investigations on inbreds of maize and their single hybrids and back crosses, stalk lodging was positively correlated with the ash, potassium, silicon and cellulose contents of the stalks [cf. *PBA*, XXVII, 1342]. Chemical analysis may therefore offer a means of preliminary screening of breeding material for susceptibility to lodging. Incidence of *Diplodia* or *Gibberella* rot was positively correlated with N content of the stalks. Degree of lodging unexpectedly failed to show any association with infection by either of these rots; possibly other pathogens and important differences in stalk characters affected lodging.

466 DeVay, J. E., Covey, R. P. & Linden, D. B.
**Methods of testing for disease resistance in the corn disease nurseries at St. Paul and comparisons of 110 lines of corn for resistance to diseases important in the North Central region.**
Plant Dis. Reptr. 1957 : **41** : 699–702.

Tests in Minnesota have provided data on the resistance of many inbred lines and crosses to *Gibberella* and *Diplodia* rots, *Helminthosporium turcicum* leaf blight and smut.

467 **Find rust-resistant Peruvian corn variety.**
What's New Crops Soils 1957 : **9** : No. 9 : 25–26.

At the University of Wisconsin, 300 strains of maize are being investigated for rust resistance. The Peruvian variety, Cusco [*sic*], was found resistant to rusts from 59 sources.

468 Jenkins, M. T., Robert, A. L. & Findley, W. R. (Jun.)
**Reaction of inbred lines of corn to *Helminthosporium turcicum* Pass. in different seasons.**
Agron. J. 1957 : **49** : 481–85.

Tabulated data are included on the leaf-blight ratings of 58 maize inbreds tested in four to six seasons together with average ratings for four, five or six years at the Plant Industry Station, Beltsville, Md. Highly significant differences were found both among the lines tested and between the seasons but variance for lines x seasons, though highly significant, was small and is thought to be of minor importance. The most resistant lines were L97, H856 and CI15, while Pd2029, Pd2287–2, Pd2289, B3510, 3–431–2–3–2–B and Oh46 showed consistently good resistance.

469 Ullstrup, A. J. & Miles, S. R.
**The effects of some leaf blights of corn on grain yield.**
Phytopathology 1957 : **47** : 331–36.

The effects of artificially-induced epiphytotics of *Helminthosporium turcicum*, *H. maydis* (*Cochliobolus heterostrophus*) and *H. carbonum* upon yields of maize hybrids were determined. The following results are of particular interest.
In the presence of a severe epiphytotic of *H. turcicum*, each resistant line included in the double hybrids was on the average responsible for an increment of about 15 bushels per acre over the yield of double hybrids composed entirely of susceptible lines. In the case of *H. maydis*, an average increase of about 5·4 bushels per acre was realized for each resistant inbred in the double-cross pedigrees. In the single experiment carried out with *H. carbonum*, the resistant single cross K61 x Pr1 produced about 75 bushels per acre in excess of the susceptible single cross K61 x Pr. In the absence of this disease, the two hybrids were equal in performance.

470 Sikka, S. M., Dhawan, N. L. & Joginder Singh
**Preliminary studies on breeding in maize for resistance to the top-shoot borer.**
Curr. Sci. 1957 : **26** : p. 221.

Two exotic inbreds, T202 and Tx61M, were found to show high resistance to *Chilo zonellus*. Further attempts are being made to breed high yielding, borer-resistant hybrids.

## BARLEY

**Proceedings of the Annual Meeting of the American Society of Brewing Chemists 1956 : Pp. 260.**

471 *Parker, J. H. & Lejeune, A. J. Prospects for new and improved varieties of malting barley.* (*pp*. 70–76).

Brief descriptions are included of six recently developed or recently introduced varieties, with details of their performance in some of the mid-west states of the USA.

472 *Meredith, W. O. S. & Bendelow, V. M. Additional criteria of malting quality in varietal studies.* (*pp*. 77–82).

Data are presented on the percentage cold water extract of a number of six-rowed and two-rowed barley varieties grown in Canada. The six-rowed varieties fell into two groups, Finnish and

Manchurian, the former being higher in enzymatic activity than the latter. Clear-cut differences in enzymatic activity between the two-rowed and six-rowed varieties were also demonstrated.

473 *Dickson, A. D. & Burkhart, B. A. Evaluation of barley varieties for malting quality.* (*pp.* 143–55).

Detailed analysis of the malting quality of 10 six-rowed varieties, 11 two-rowed varieties and four six-rowed Coast types has been carried out by the Barley and Malt Laboratory of the Agricultural Research Service of the USDA.

474 *Lindegren, C. C. The possible application of yeast genetics to brewing.* (*pp.* 165–68).

Mention is briefly made of "reassortment of genes", gene mutation, loss of cytoplasmic particles and sensitivity to toxic or harmful agents and their bearing on the choice of yeast strains by brewers.

475 Wintergerst, 1957. (**Winter barley, 1957**).
Landbouwvoorlichting 14 : Bijl. 13; Ber. Rassenkeuze 1957 : No. 230 : unpaginated.

In trials of nine varieties carried out in the Netherlands, the new variety Dea [cf. XXVI, 2336] gave high yields on all soil types. It is to be included in the official variety list for 1958.

476 Wilten, W. & Coenradie, J.
De veldproeven in 1956. (**Field trials in 1956**).
21e Nacobrouw Jb. 1957 : 77–90.

Data on the performance of barley varieties in trials conducted in the Netherlands in 1956 are presented.

477 Wilten, W.
Opbrengsten, rassenstatistiek en raseigenschappen van zomergerst. (**Yields, varietal statistics and varietal characters of spring barley**).
21e Nacobrouw Jb. 1957 : 91–93.

Tables and notes on the performance of malting and fodder barleys over the period 1946–1956 are presented. Information on earliness, straw, ear and grain characters and resistance to various disorders is provided for ten varieties.

478 Veatch, C.
**Winter barley variety trials in West Virginia, 1949-1955.**
Bull. W. Va. agric. Exp. Sta. 1956 : No. 392 : Pp. 14.

The results of trials of varieties and selections at five centres in West Virginia during the above seven-year period are summarized.

479 Sierra, J. A.
Avances del mejoramiento de cebada en Colombia en 1956. (**Advances in barley breeding in Colombia in 1956**).
Agricultura trop. 1957 : **13** : 433–47.

The variety Funza [cf. XXVI, 3309] has proved successful in most provinces except Nariño, where it has proved susceptible to dwarfing caused by *Cicadulina pastusae*. A selection of Funza x Tcheschester 929–II–211–10B–10B (1–14B) has given yields of up to 3746 kg. per ha. and has been named Bachué; it matures in 125 days, stands well and is resistant to *Rhyncosporium hordei* and *Puccinia hordei* but not to *P. graminis*.

Another hybrid of Funza, named Tequendama, combines good malting quality with satisfactory yield and resistance to *Helminthosporium* sp., fairly good standing capacity and a maturity period of 130 days.

Some of the breeding lines have displayed resistance to *Helminthosporium* (*Pyrenophora*) *teres* and some to *P. graminis*; resistance to dwarfing caused by *C. pastusae* has been found in certain lines and in the local variety Raspa. Several of the hybrids now being tested have exceeded Funza in yield, some by up to 76%, but few if any have excelled it in malting quality.

Observations have been made on some hybrids of *Hordeum leporinum* x *H. vulgare* received from Canada and tests for reaction to *P. graminis* and other diseases have been carried out with lines from the International Rust Nursery in the USA.

480 Wettstein, D. von
**Mutations and the intentional reconstruction of crop plants.**
Hereditas, Lund 1957 : **43** : 298–302.

Chiefly with reference to repatterning of straw morphology in breeding for resistance to lodging, the author discusses the possibilities and problems of improving barley by directed mutation [cf. XXVII, p. 590].

481 Gaul, H.
Die verschiedenen Bezugssysteme der Mutationshäufigkeit bei Pflanzen angewendet auf Dosis-Effektkurven. (**Different expressions for mutation frequency in plants and their use in dosage-effect curves**).
Z. Pflanzenz. 1957 : **38** : 63–76.

The expression number of mutants/100 $X_2$ plants is proposed for determining frequency of point mutations in barley after seed irradiation, instead of the more usual expressions number of mutations/100 $X_1$ ear progenies and number of mutations/100 $X_1$ plant progenies, neither of which allows for the increase in spike sterility and consequent loss of mutants found with increasing dosage. In experiments with chlorophyll mutants in barley, the suggested expression plotted against dosage gave a straight line while with the other expressions a curve flattening with increasing dosage was obtained. It is suggested that deviations greater than can be excluded by means of the above expression may result either from intraindividual selection (diplont selection), in which mutated cells tend to be eliminated through competition with nonmutant cells, or from gametic elimination (haplont selection).

482 EHRENBERG, L. & LUNDQVIST, U.
**Post-irradiation effects on X-ray-induced mutation in barley seeds.**
Hereditas, Lund 1957 : **43** : 390–402.

Higher percentages of sterility and mutation were obtained when seeds of Bonus were germinated at 5° C. than at 20° C. after X irradiation. The frequencies of *albina*, *viridis* and other types of mutation were affected similarly by the germination temperature. It is concluded that the effect of postirradiation temperature on the rate of induced point mutations involved a modification of the primary injury. With adverse conditions of germination, both spike number and mutation rate were reduced as the result, it is suggested, of the elimination of the genetically-altered primordial cells. *Viridis* mutations were more subject to elimination than other types.

483 EHRENBERG, L., GUSTAFSSON, Å. & LUNDQUIST, U.
**Chemically induced mutation and sterility in barley.**
Acta chem. scand. 1956 : **10** : 492–94.

Resting or presoaked grains were treated for varying lengths of time with solutions containing N-mustard, ethylene oxide, chlorine, iodine, dioxan, nebularine or ethoxycaffeine. Although the possibility that dauermodifications or plasmon mutations were induced cannot be excluded, since the third generation was not studied, there was evidence that ethoxycaffeine gives rise to degrees of sterility corresponding with those obtained by X-irradiation up to 6000 r. but not to any significant increase in mutation frequency, while nebularine gives a relatively high mutation frequency without inducing sterility. The distribution of chlorophyll mutants induced by nebularine differed from that obtained in other treatments, *viridis* being predominant. The alkylating and oxidizing agents were less specific and caused both sterility and mutation, ethylene oxide giving about the same distribution of mutation types as X-ray treatment. The last mentioned compound acted proportionally to concentration while nebularine was most active at lower concentrations.

484 WILTEN, W.
Verwantschap van de verschillende gerstrassen. **(Relationship of the different barley varieties).**
21e Nacobrouw Jb. 1957 : 67–71.

Diagrams showing the pedigrees and interrelationships among Scandinavian and among German spring barleys are presented and discussed. In the parentage of the former group Hanna has played a major role while in that of the latter Isaria has been important. Information is also given on the origins of current English and Irish varieties developed from crosses with stiff-strawed Scandinavian varieties, and of Netherlands varieties, several of which include *Hordeum distichum* var. *laevigatum* in their ancestry.

485 HÖRBERG, Y.
Weibulls Original Ingridkorn. **(Weibull's original barley Ingrid).**
Weibulls Årsb. 1957 : 3–4.

Due to be released in spring 1958, Ingrid, developed from the cross Balder x (Binder x Opal), is characterized by greater stiffness and elasticity of straw than either Herta or Rika and is resistant to breaking even when overripe, so that it is particularly suitable for combine harvesting. It is superior to the above varieties also in malting quality, ripens some days earlier than other southern and central Swedish varieties and equals Rika in yield.

486 SCHLEHUBER, A. M., OSWALT, R. M., CURTIS, B. C. & CROY, L. I.
**Rogers winter barley.**
Bull. Okla. agric. Exp. Sta. 1957 : No. B–490 : Pp. 11.

A full description is given of the above variety [cf. XXVII, 529]. It is a reselection of Oklahoma 1005.

487 **New Forrest barley released in Minnesota.**
What's New Crop Soils 1957 : **9** : No. **9** : p. 27.

Forrest resembles Kindred in yield and height, but has better straw strength, larger kernels, higher bushel weight and slightly later maturity. It is more resistant than many common varieties to *Helminthosporium sativum* (*Colchiobolus sativus*) and stem rust but is susceptible to loose smut, mildew and *Septoria*. Malting and brewing tests gave favourable results. [Cf. XXVII, 4028].

488 HARPSTEAD, D. D.
**Liberty barley released.**
Bull. S. Dak. agric. Exp. Sta. 1957 : No. 462 : Pp. 4.

This barley variety, selected from (Lion-Manchurian-Chevron) x Titan, has been released by the South Dakota Experiment Station. It is a six-rowed, white-aleurone, smooth-awned type, superior in straw strength to Kindred and Odessa. It is resistant to the common races of stem rust and mildew but susceptible to loose smut and *Septoria*. Its malting quality is similar to that of Odessa but its grey seed colour may make it unattractive for this purpose. [Cf. XXVII, 4028].

489 SCHOOLER, A. B., NILAN, R. A. & PHILLIPS, L. L.
**The effects of fractionated doses of X-rays on dormant barley seeds.**
Northw. Sci. 1957 : **31** : No. 2 : 80–91.

Continuous and fractionated treatments were not found significantly different in their effect on seedling height, field survival and the production of chromosome aberrations and chlorophyll-deficient mutations in the barley Himalaya. The production of rod and isodiametric fragments slightly increased when the interval between treatments was lengthened; this may not be significant. Successive fractions of an X-ray treatment were found additive in producing chromosome aberrations. It is suggested that latent breaks may be produced in the dormant embryo and that these become actual breaks when active metabolism begins.

490 GAUL, H.
Über die Bedeutung der Fixierungszeit bei der zytologischen Untersuchung von Sprossspitzen nach Röntgenbestrahlung. **(The importance of the time of fixation in cytological investigations of the plumule tips after X irradiation).**
Naturwissenschaften 1957 : **44** : p. 403.

Barley grains that had been irradiated with X rays were fixed when the plumules had developed to a length equal to that of the caryopsis, which stage was reached at different times by different grains. Those that reached it after 48 hr. were found to have a lower proportion of bridges than those that reached the stage only after 87 hr. The number of fragments was roughly the same in both.

491 KUSHIBUCHI, K., SATO, H., KANEDA, C. & MITA, K.
**(The relative difficulty of removing the husk from naked barleys).**
Ikushugaku Zasshi/Jap. J. Breeding 1957 : **6** : 212–16. [Japanese].

Data are provided on the ease of artificially separating the grain from the glume in a series of Japanese naked-barley varieties. Separation was easy in semibrachytic varieties; in varieties of normal stature, all degrees of separability were encountered. Easy separation was correlated with a high value for the breadth/length ratio of the glume aperture and with high values of the breadth/length ratio of the grain. The latter characteristic has a relatively high heritability.

492 YAMAMOTO, T.
**(Studies on sterility in barley. VIII. Abnormal behaviour of pollen tubes in the style and its causes).**
Ikushugaku Zasshi/Jap. J. Breeding 1957 : **6** : 221–27. [Japanese].

Minor aberrations in the form of pollen tubes and the direction of their growth in compatible pollinations are described and their probable causes discussed.

493 HOZUMI, K. & IGASKI, T.
**(Artificial germination of barley pollen).**
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1957 : **25** : 139–40. [Japanese].

The optimum medium contained 10% starch and 15% sucrose.

494 GÄRTNER, K.
A fajtatiszta sörárpa jelentősége a söriparban. **(The importance of pure varieties of malting barley in the brewing industry).**
Söripar, Budapest 1956 : **6** : 133-37.
[from: Hungar. agric. Rev. 1957 : **6**: No. 2 : 3–4.]

Seven certified malting barleys, four new strains and three Polish varieties grown in 15 localities in Hungary were evaluated for yield, protein content, nitrogen-free extract, thousand-grain weight and beer quality. Organoleptic characters showed no correlation with chemical composition, the former being more influenced than the latter by environmental factors. Martonvásár 104 was best in protein content.

495 BASS, E. J., BENDELOW, V. M. & MEREDITH, W. O. S.
**Enzymes that degrade barley gums. V. Relation between endo-beta polyglucosidase activity and other barley and malt properties.**
Cereal Chem. 1957 : **34** : 219–25.

Analysis of 15 barley varieties grown at five stations in Canada during 1956 showed that the cytolytic activity of green malt, as measured by endo-β-polyglucosidase activity, is a varietal characteristic [cf. XXVI, 3323]. In most varieties high cytolytic activity of green malt was associated with good general malting quality. Barley cytolytic activity was not related to general malting quality or cytolytic activity of green malt. The following malt properties were determined in the 15 varieties: saccharifying activity, α-amylase activity, cold-water extract, malt extract and index of protein modification. Of the 15 coefficients relating all possible pairs among these properties and the cytolytic activity of green malt, 14 were significant at the 1% level while one (malt extract and α-amylase) was significant at the 5% level. Since the highest correlations were obtained between cold-water extract and other properties, it is suggested that this extract provides one of the best single measures of general malting quality. Determination of cytolytic activity on the basis of endo-β-polyglucosidase activity may be of assistance in evaluating malting quality but additional investigation is required to clarify the following conflicting results: in Parkland, Br.3902 and Br.3831 relatively low cytolytic activity was associated with satisfactory malting qualities; in UM913 and Br.4417 relatively high activity was associated with one or more unsatisfactory malting properties.

496 REINBERGS, E. & HUNTLEY, D. N.
**Some factors affecting hull adherence in barley.**
Canad. J. Plant Sci. 1957 : **37** : 262–73.

Twenty-five varieties of barley were studied and significant differences were found in hull adherence during malting and consequently in kernel damage. Moore and GP69 had very low percentages of damaged kernels. Many varieties had better hull adherence than the common malting varieties OAC21 and Montcalm.

497 TOHTUEV, A. V.
**(The spring barley Omsk 13709).**
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1957 : No. 1 : 40–42. [Russian].

Omsk 13709 was selected from a land variety in the Slavgorod district. It has large grain, good malting properties and shows resistance to shedding, lodging, insects, and diseases, in particular loose smut and *Helminthosporium*. It outyields Europaeum 353/133 and Viner, the standards for the provinces of Omsk and Krasnojarsk respectively.

498 MOSEMAN, J. G.
**Host-parasite interactions between culture 12A1 of the powdery mildew fungus and the $Ml_k$ and $Ml_g$ genes in barley.**
Phytopathology 1957 : **47** : p. 453. (Abst.)

Resistance to races 3 and 8 of *Erysiphe graminis* var. *hordei* depended upon $Ml_k$ in the variety Kwan and upon $Ml_g$ in Goldfoil. Culture 12A1 of race 12 contained one gene for pathogenicity to Kwan and another independently inherited gene for pathogenicity to Goldfoil.

499 PATTERSON, F. L., SHANDS, R. G. & DICKSON, J. G.
**Temperature and seasonal effects on seedling reactions of barley varieties to three races of *Puccinia graminis* f. sp. *tritici*.**
Phytopathology 1957 : **47** : 395–402.

The effects of temperatures of 16°, 20°, 24° and 28° C., during and after inoculation, upon the seedling reactions of 52 varieties to races 17, 19 and 56 were determined. Differences among varieties on which both flecking and pustules developed were most satisfactorily indicated by the number and type of pustules. Temperature influenced the frequency and size of the pustules and reaction type. Season also affected reactions. In the case of most varieties, seedling reactions at 28° C. and adult plant reactions in the field or greenhouse were in close agreement.

500 CYMBAL, M. M.
**(Leaf stripe of barley and its control in the Ukrainian steppe).**
Zemledelie (Agriculture) 1957 : No. 7 : 87–88. [Russian].

Mention is made of new varieties D57/45 and D20/45 showing resistance to *Helminthosporium* under the conditions of the Odessa province. Of the older varieties, Odessa 09 possessed the highest degree of resistance.

501 SKOROPAD, W. P. & ARNY, D. C.
**The influence of amino acids on the growth of two strains of *Helminthosporium gramineum*.**
Phytopathology 1957 : **47** : 249–52.

Differences have been found between two strains of *H. gramineum*, differing in pathogenicity to barley, in respect of their growth response in culture in the presence of a number of amino-acids extracted from malt.

502 SUNESON, C. A. & RAMAGE, R. T.
**Studies on the importance of the yellow-dwarf virus.**
Agron. J. 1957 : **49** : 365–67.

The paper discusses chiefly the results of tests carried out for six years in California to determine the reactions of the principal commercial barley varieties of the USA and Canada to the above virus. Techniques for controlled mass infection in split plots by means of aphids are described. Marked varietal differences in reaction were noted but the results emphasized difficulties in diagnosis, particularly in the case of different growing conditions or unfamiliar varieties. Breeding for resistance to the vectors or virus appears to be desirable to reduce losses in yield not only in barley but also in wheat and oats.

503 ALLEN, T. C. (JUN.)
**Strains of the barley yellow-dwarf virus.**
Phytopathology 1957 : **47** : 481–90.

This report is an extended version of one summarized already [XXVII, 1800].

## MILLETS AND SORGHUMS

504 ARDAŠEV, M.
**(The cultivation of *Setaria italica* in the Baškirian ASSR).**
Zemledelie (Agriculture) 1957 : No. 4 : 82–84. [Russian].

A new high-yielding variety, Ufa, has been bred in Baškiria. It has a short growth period and shows resistance to lodging, shedding, pests and diseases.

505 IYENGAR, G. S. & IYENGAR, K. G.
**An improved variety of Italian millet —Navane.**
Mysore agric. J. 1957 : **32** : 54–56.

Twelve local races of *Setaria italica* were studied. Selection from Honakere 4 has produced Kempu. This variety has greater vigour than local types and an increased yield of grain and straw of 25–40%.

506 KAJJARI, N. B. & PATIL, J. A.
**A male-sterile bajri.**
Indian J. Genet. 1956 : **16** : p. 146.

Plants of *Pennisetum typhoides* which do not produce pollen have been discovered at Niphad.

507 IYENGAR, K. G. & LAKSHMANIAH, C. H.
**Aruna, an improved variety of irrigated ragi.**
Mysore agric. J. 1957 : **32** : 29–32.

The performances of varieties of *Eleusine coracana* have been compared. Aruna has been selected from the race 3 months nati. It is early, high yielding and ripens uniformly.

508 VARGAS SACO, R. & ROJAS M., E.
Sorgos forrajeros y escoberos. (**Forage and broom sorghums**).
Inf. Estac. exp. agríc. La Molina 1957 : No. 102 : Pp. 21. (Mimeographed).

Tests carried out with a number of varieties from the USA showed the best yielding ability in Sugar Drip, closely followed by Kansas Sourless. They give two crops of fodder in the season, the yield being roughly equal to that from maize but the expense of cultivation much less. They exceed the maize yields under conditions of low humidity and the fodder is higher in sugar and lower in fibre content.

The broom-sorghum varieties White Station and Pennol from the USA were equal to the local variety Común [Common] in yield of fibre but the fibres were finer and more uniform; the grain yield was considerably higher in the imported varieties.

509 GOODSELL, S. F.
**Germination of dormant sorghum seed.**
Agron. J. 1957 : **49** : 387–89.

In programmes on the development of $F_1$ hybrids of sorghum, it may be desirable to grow two or three generations of breeding stocks each year. This necessitates harvesting of the seed when slightly immature, and immediate drying. Breeders have however found that seed thus obtained may be temporarily dormant. Mechanical scarification or hot-water treatment of short duration has proved effective as a means of breaking dormancy at the Seed Testing Laboratory, Pioneer Hi-Bred Corn Co., Johnston, Ia.

510 FRANZKE, C. J. & ROSS, J. G.
**A lineal series of mutants induced by colchicine treatment.**
J. Hered. 1957 : **48** : 47–50.

A full account of sorghum investigations referred to earlier [XXVII, 1809] is provided. The immediately true-breeding behaviour of the new types is explained by postulating that reductional division in the somatic tissue subsequent to colchicine-induced gene mutation is followed by doubling of the chromosome number.

511 **They are creating history with millets.**
Indian Fmg. 1957 : **7** : No. 2 : 13–14.

Some of the work of the Millets Breeding Station at Coimbatore is briefly described. A recently developed variety of *Sorghum vulgare*, Co. 18, combines the high-yielding character of one parent, Co. 9, with the sweet, juicy stalk of the other, a mutan strain from Madurai. A cross between an African variety, Bong enhilo, and Co. 1 has given high-yielding progeny resistant to both drought and *Striga*. Hybrids have been made between *S. vulgare* and *S. halepense* with a view to developing drought-resistant strains and the progeny are undergoing selection for drought resistance, bold grains and other desirable characters. Two promising hybrids of *Pennisetum typhoideum* have been developed and four others with short growth periods are undergoing field trials.

512 RAMABHADRAN, G. & DIVAKARAN, K.
**Millets in Ramanathapuram and Tirunelveli districts with special reference to spread of strains.**
Madras agric. J. 1957 : **44** : 185–90.

Varieties of *Sorghum vulgare*, *Pennisetum typhoides*, *Eleusine coracana*, *Setaria italica* and *Paspalum scrobiculatum*, which are grown locally, are described. Special mention is made of improved strains of *S. vulgare*, *P. typhoides* and and *E. coracana*.

513 **New Redbine 58 is early grain sorghum.**
What's New Crops Soils 1957 : **9** : No. 8 : p. 27.

The above variety has been developed by the Texas Agricultural Experiment Station and the Midwest Research Institute and Corn Products Refining Co. It is earlier than most other combine varieties and gives a more reliable performance under dry conditions and at higher altitudes. Its grain is hard, reddish-yellow and threshes and germinates well. Its parentage includes Martin but details of its origin are not given.

514 DOGGETT, H.
**Bird-resistance in *Sorghum* and the *Quelea* problem.**
Field Crop Abstr. 1957 : **10** : 153–56.

The review discusses mainly the plant characters which may help to reduce bird damage due to *Quelea* spp. in Africa. In attempts by several workers to breed resistant varieties, the principal characters being used are bitterness of the grains when green, large glumes and pendent heads.

515 HOWITT, A. J. & PAINTER, R. H.
**Field and greenhouse studies regarding the sources and nature of resistance of sorghums, *Sorghum vulgare* Pers., to the corn leaf aphid, *Rhopalosiphum maidis* (Fitch).**
Tech. Bull. Kans. agric. Exp. Sta. 1956 : No. 82 : Pp. 38.

Data are provided on the degree of infestation by *Rh. maidis* and comparative rates of reproduction of the aphid on a large number of *Sorghum* varieties and hybrids, many of which came from a world germ-plasm collection, in tests made at the Kansas Agricultural Experiment Station. The methods used for the analysis of resistance are described in some detail. Differences in aphid resistance between plants of the same strain were found in some cases but varieties of the Sudan-grass type showed a consistently high level of resistance and it is concluded that they are preferentially avoided by the aphid and also carry antibiotic factors for resistance. In the case of a single plant of Piper Sudan the antibiotic effect was so high as to approach immunity.

## RICE

516 JOHNSON, T. H.
**Rice breeding and varietal testing.**
Rice J. 1957 : **60** : No. 7 : 62–63.

Neutron and γ-ray treated material of Zenith and Arkrose is undergoing screening preparatory to use in the breeding programme at the Rice Branch Experiment Station, Stuttgart, Ark.

517 JODON, N. E.
**Summary of rice linkage data.**
US Dep. Agric., Pl. Industr. Sta., Beltsville, Md. 1948 : Pp. 34. (Mimeographed).

All available linkage data are summarized here, together with details of the crosses from which evidence of linkage was obtained, cross-over percentages as observed and as calculated using Immer's tables and data on independent inheritance. The data are provisionally arranged in eight groups, insufficient evidence being available at present to establish the four possible remaining groups.

518 Classificazione del riso in Birmania. (**The classification of rice in Burma**).
Riso, Milano 1957 : **6** : No. 6 : 8–10.

Brief descriptions are given of the five types of rice cultivated in Burma together with a list of the varieties comprising each group.

519 ANGLADETTE, A.
Notes sur la riziculture indonésienne. **(Notes on Indonesian rice cultivation).**
Riz et Rizic. 1957 : **3** : 103–19.

This general review mentions varieties and hybrids which have been found suitable for different areas of Indonesia. Reference is made to disease resistance, lodging and sensitivity to photoperiod.

520 FUJII, Y. & TANAKA, N.
**(On guttation in rice seedlings and the earliness or lateness of the varieties).**
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1957 : **25** : 131–32. [Japanese].

Guttation and bleeding of seedlings were more pronounced in the case of late varieties, both under normal conditions and in sucrose-solution cultures of various concentrations.

521 BANERJEE, S. N. & GUHA, B. C.
**Thiamin values of pure-bred strains of rice.**
Rice J. 1957 : **60** : No. **6** : p. 34.

The thiamin contents of 89 varieties of rice were found at Calcutta to vary from 1·0 to 6·0 $\mu$g./g. of brown rice. Since similar values for each were obtained in two successive harvests it is concluded that thiamin content is a stable varietal characteristic.

522 SAMPATH, S. & SESHU, D. V.
**Variability in protein content of rice.**
Curr. Sci. 1957 : **26** : p. 139.

An analysis of varieties and the $F_2$ of a cross between the short-glumed variety AC 789 and the long-glumed AC 1224 at the Central Rice Research Institute, Cuttack, India, revealed that long glumes were associated with higher protein content of the grain than short glumes. Tetraploids of *Oryza sativa* had a higher protein content than cultivated diploids but were poor in yield. *O. australiensis* also contained more protein than cultivated rice.

523 OGURA, T.
**(Studies on upland rice. IV. On the anatomy of the seminal root).**
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1957 : **25** : 154–56. [Japanese].

A series of upland varieties is differentiated from a series of irrigated rices by means of the tranverse anatomical structure revealed by the transverse section of the seminal root.

524 PAWAR, M. S., NARAHARI, P. & SURYANARAYANA MURTHY, V. V.
**Studies on the absence of junctura, auricle, and ligule in rice, *Oryza sativa* L.**
Ann. Bot.,.Lond. 1957 : **21** : 381–84.

Among normal plants of Shala growing at Himayet Sagar, Hyderabad, some were found showing complete absence of junctura, auricle and ligule. Of these abnormal plants some bred true while the progeny of others segregated into types showing all three characters or none of them. From this it is concluded that the absence of these characters is dominant to their presence and since no intermediate forms were observed it is further concluded that their expression is inherited as a single unit.

525 BEACHELL, H. M. & HALICK, J. V.
**Breeding for improved milling, processing and cooking characteristics of rice.**
News Lett. FAO Internat. Rice Comm. 1957 : **6** : No. 2 : 1–7.

A series of varieties has been studied in the USA. Processing and cooking qualities have been compared by means of the parboiling-canning and cooking-soaking tests. An attempt has been made to produce a new variety with superior processing and cooking characteristics by selection from the cross Bluebonnet x Century Patna 231. Average milling output for important commercial rice varieties is shown. Tests have indicated that the difference in milling, processing and cooking characteristics is largely hereditary.

526 BATCHER, O. M., DEARY, P. A. & DAWSON, E. H.
**Cooking quality of 26 varieties of milled white rice.**
Cereal Chem. 1957 : **34** : 277–85.

The cooking qualities of 26 varieties were evaluated by measurements of physical and chemical characteristics and by palatability tests, as in a previous study of eight varieties [XXVII, 4069]. Variety and environment, as well as grain type, affected water absorption during cooking, volume of cooked rice, the pH and contents of starch and total solids of the residual cooking liquid, and palatability. Highly significant correlations were found between (1) water-uptake ratio and cohesiveness (+ 0·674), (2) total solids in the residual cooking liquid and cohesiveness (— 0·558) and (3) water-uptake ratio and score for flavour (+ 0·675). A three-way correlation of + 0·740 was obtained for water-uptake ratio, total solids and cohesiveness.

527 Rabechault, H.
Anatomie comparée des organes végétatifs de deux riz de l'Ouest Africain. **(The comparative anatomy of the vegetative organs of two West African rices).**
Agron. trop., Nogent. 1957 : **12** : 313–28.

The anatomy of the root, stem and leaf of *Oryza barthii* and *Oryza glaberrima* is described.

528 Oka, H.-I. & Fang, C.-C.
**(Classification of rice varieties by discriminant functions. Phylogenetic differentiation of cultivated rice. XIV).**
Ikushugaku Zasshi/Jap. J. Breeding 1957 : **6** : 245–48. [Japanese].

Discriminant functions based on resistance to $KClO_3$, cold resistance, drought resistance, number of days required for germination, grain weight at shedding, length/breadth ratio of the grain, length of apiculus hairs, awn length and reaction of endosperm to KOH were calculated for the Continental, Tropical Insular and Temperate Insular varietal groups recognized by the authors. The discriminant functions enabled a satisfactory distinction to be drawn between typical Continental and Insular varieties but a continuous range of varieties intermediate between those typical of the varietal groups also exists.

529 Syakudo [Shakudo], K., Kobori, O. & Kawase, T.
**[Studies on quantative inheritance. XV. A. Rice. (e) Studies on the inheritance and quantitative function of the genes determining yield. (1) On the effect of genes $E_3$, $E_4$ and $E_5$, controlling heading period, on weight of ears per plant].**
Ikushugaku Zasshi/Jap. J. Breeding 1957 : **6** : 237–44. [Japanese].

$F_3$–$F_6$ generations of the crosses Aikoku [Patriotism] x Ginbozu [Silver Bonze], Kyotoasahi [Kyoto Rising Sun] x Aikoku and Kyotoasahi x Ginbozu were studied [cf. XXV, 3082]. A pleiotropic effect of the genes above mentioned on ear weight was detected but the mode of interaction of these genes in respect of their effect on ear weight appeared to be complicated. While ear weight generally increased with length of heading period, this relationship failed to hold in plants ripening in Kyoto after mid-September, presumably because of the drop in temperature.

530 Sakai, K.-I. & Utiyamada [Uchiyamada], H.
**Studies on competition in plants. VIII. Chromosome number, hybridity and competitive ability in *Oryza sativa* L.**
J. Genet. 1957 : **55** : 235–40.

This is the full version of an article summarized from an earlier report [cf. XXVII, 3831].

531 Rajagopalan, K.
**Studies on drought resistance in rice.**
Madras agric. J. 1957 : **44** : 194–205; 227–37.

Crosses were made between cultivated varieties and drought-resistant wild varieties of *Oryza sativa* f. *spontanea*. Four generations of nine hybrids were investigated. Drought-resistant progenies possessing the good qualities of cultivated varieties were obtained. Drought resistance was found to be an inherited character associated with certain morphological characters such as a highly developed root system. The hybrids with the shortest duration of flowering were most drought resistant.

532 Johnston, T. H.
**New rice varieties give high yields.**
Rice J. 1957 : **60** : No. **5** : 34–35, 51.

The performance of medium and long-grained varieties in tests in Arkansas during 1956 is discussed. Although the medium-grained varieties (Arkrose, Nato and Zenith) gave high yields, they are susceptible to lodging. Selections with short stiff straw and short, medium or long grain are being developed. The possibility of obtaining the desired type of straw in radiation-induced mutants of Zenith and Arkrose is being explored.

533 Atkins, J. G., Beachell, H. M. & Crane, L. E.
**Testing and breeding American rice varieties for resistance to straighthead.**
News Lett. FAO Internat. Rice Comm. 1957 : **6** : No. 2 : 12–15.

The substance of this article has been summarized from an earlier source [cf. XXVII, 583].

534 Horváth, P.
Biztosan és bőventermő rizsfajták felkutatása. **(The search for rice varieties giving high and reliable yields).**
Agrártudomány 1956 : **8** : 392–94.

In varietal tests conducted at three localities in Hungary, the late-ripening Rumanian variety Linea 45 was the most productive, had a high 1000-grain weight and a good hulling rate and was highly resistant to blast. The best Hungarian variety was Káta Gyöngye [Reed Pearl].

535 **Annual Report of the West African Rice Research Station, 1955** : Pp. 28.

Field trials were continued with promising introductions and selections from established varieties. Milling tests are intended for some of the older selections. Selections were made from the Ceylon variety Kurulutuduwi 613 with the object of starting a new series, from which it is hoped to select a strain resistant to *Piricularia oryzae*.

Selection was continued with the following crosses: Torma 112 x Ngasein 57; India pa lil 46 x Kav. 12; DC39 x Yenti; Ngasein 57 x Tai Chu and Indo-China 24 x Indo-China 53.

536 Subba-Rao, N. S. & Suryanarayanan, S.
**Exosmosed substances on the leaf-blade of rice (*Oryza sativa* L.).**
Curr. Sci. 1957 : **26** : 186–87.

Substances exosmosed by the leaves included alanine, methionine, tryptophane and lysine in both the blast-resistant variety Co.4 and susceptible Adt. 10. In addition, glycine was exosmosed by Adt. 10 and succinic acid by Co.4. The bearing of this result upon the nature of blast resistance is briefly discussed.

## FORAGE GRASSES

**Proceedings of the Seventh International Grassland Congress held at Massey Agricultural College, Palmerston North, New Zealand, 6-15th November, 1956** : Pp. 611.

Among the papers presented at this congress the following are of interest to plant breeders.

537 *Vincent, J. M. Strains of* Rhizobia *in relation to clover establishment. (pp. 179–89).*

In reviewing work on this topic the author lays emphasis on the diversity shown by isolates of *Rhizobium* in respect of their serological, cultural and symbiotic behaviour, on the establishment of subgroups among *Trifolium*, *Medicago* and *Melilotus* species reacting similarly to rhizobial strains and on the factors affecting the usefulness of different strains under field conditions.

538 *Hartley, W. & Williams, R. J. Centres of distribution of cultivated pasture grasses and their significance for plant introduction. (pp. 190–201).*

It is pointed out that of the 40 or so known cultivated grass species about 24 form part of the indigenous flora of the Eurasian region, eight occur in the East African region and four in the South American region. The Mediterranean area is regarded as a subregion of the Eurasian since the cultivated pasture grasses of both regions are closely related. The more important influences which have led to the present distribution pattern are thought to be: (1) conscious and unconscious human selection, (2) ecological factors, especially the distribution of the major vegetation types, (3) taxonomic affinities at the specific and tribal level and (4) the general evolutionary development of the grasses and of the grazing animals. Outline recommendations are made for a plant introduction programme designed to make available new species and strains of pasture grasses for cultivation.

539 *Gregor, J. W. Genotypic-environmental interaction and its bearing on a practical problem of international interest. (pp. 202–11).*

After mentioning the need for acquiring accurate information about strains of herbage plants the author points out that differences between genotypes can only be observed as phenotypic differences but under the conditions of a uniform environment all observed differences will reflect genetic differences. Examples are given of the capacity of genotypes to respond phenotypically to different latitude or microclimate differences and the effects of such responses on the agronomic status of the strains under investigation are pointed out. Not all the phenotypic changes induced by particular environments are adaptive, although they may appear to be so. Genotypic diversity may not always be apparent in the wild, especially in populations occupying the more extreme kinds of habitat, but it is emphasized that when a phenotype has a relatively high survival advantage under the prevailing environment its genotype and any others of similar phenotype will probably be selected for. Evidence from studies with *Drosophila* is presented to show that the inherent potentiality for phenotypic plasticity of a genotype may be permanently altered by the action of its environment.

The difficulty of planning strain tests which will adequately reflect all the environmental and cultural influences which affect the agronomic performance of a strain is mentioned and the choice of characters to be recorded and methods of testing are discussed. Finally the advantages of national over international trials are pointed out and the application of the International Code of Nomenclature for Cultivated Plants to herbage plants is considered.

540 *Hiesey, W. M. Responses of hybrid bluegrass strains to contrasting environments.* (*pp. 212–21*).

Details are given of the behaviour of parents and progeny of the two crosses *Poa ampla* x *P. pratensis* ssp. *alpigena* and *P. scabrella* x *P. ampla* when grown at different altitudes and latitudes in Europe and the USA. Many of the progeny are apomictic and in some cases wide variation in response to varied environments has been shown by separate apomictic lines from the same initial cross. It has been found possible to incorporate the genomes of three or more distinct entities into a self-perpetuating apomictic combination but in such cases it is difficult to predict the performance of the apomictic derivative when the parental species have different growth characteristics and ranges of tolerance. Some derivatives from a combination of *P. scabrella* from southern California, *P. pratensis* from Mather, Calif., and *P. pratensis* ssp. *alpigena* from Lapland appear to have potential agronomic value.

Preliminary investigations at the Earhart Laboratory, California Institute of Technology, have shown that the relation between day and night temperature may be important in the control of growth and flowering in *Poa*, together with photoperiodic effects [cf. XXVII, 134].

541 *Rebischung, J. Grass breeding and environment.* (*pp. 222–28*).

Some of the problems facing grass breeders are briefly discussed and some techniques used at the Central Station for Plant Breeding, Versailles, France, are described. Emphasis is laid on the interaction between genotype and environment and on the effects of selection pressures, which are peculiar to each environment.

542 *Smith, D. C. The nature of forage crop varieties in relation to methods of improvement.* (*pp. 404–14*).

Examples are given of the taxonomic complexity of many grass species, reference being made to polyploid series in *Panicum* and *Agrostis*. It is pointed out that the character differences between strains which are of greatest importance to the breeder are those involving different responses to different environments and the need for ecological studies using strains rather than species is emphasised. So far little direct improvement of forage varieties in respect of vigour or yield has been obtained in the USA and although disease resistance and winter hardiness have been improved it is generally true that long-established local farm varieties are equal to new bred varieties.

543 *Frandsen, K. J. Progeny testing methods.* (*pp. 415–26*).

After discussing the methods used in producing progeny, the factors determining the choice of method and the rival merits of spaced plantings and normal plots in progeny testing, the author outlines methods for producing progeny for two groups of plants, firstly those species in which formation and maintenance of clones can be carried out and secondly those in which the formation of clones is difficult.

544 *Corkill, L. The basis of synthetic strains of cross-pollinated grasses.* (*pp. 427–38*).

Methods of testing for general combining ability and for maintaining vigour in synthetic strains are discussed and illustrated by means of results obtained in studies with perennial ryegrass in New Zealand. It is recommended that greater emphasis should be placed on high combining ability and low inbreeding depression in selecting basic plants in order to produce synthetic strains in which maximum advantage is taken of hybrid vigour.

545 *Burton, G. W. Utilisation of heterosis in pasture plant breeding.* (*pp. 439–49*).

After citing examples of the occurrence of heterosis in pasture species the author discusses current or proposed methods of utilizing heterosis in the breeding of pasture species under the following headings: (1) $F_1$ propagated vegetatively, (2) $F_1$ propagated by apomictic seeds, (3) $F_1$ propagated by sexual seeds, (*a*) perennials and (*b*) annuals, and (4) inbreeding.

546 *Torrie, J. H. Breeding for quantitative characters.* (*pp. 450–60*).

The topics discussed include the value of inbreeding, methods of evaluating breeding material, progeny and combining ability, correlation of characters, the use of synthetics and recurrent selection, comparison of testing methods and investigation of the inheritance of quantitative characters.

547 *Glenday, A. C. & Fejer, S. O. The use of discriminant functions in the selection of pasture plants, with particular reference to the* Lolium *species.* (*pp. 461–70*).

The application of the maximum *F* and maximum advance methods to yield characters of *Lolium* spp. is described and it is concluded that the discriminant technique can aid in accelerating genetic progress where the characters measured do not have the same importance, especially where progress by normal methods is slow, as in the final stages of selection. It is also concluded that this form of analysis provides useful information on the relationships between yield characters, even where the derived function fails to accelerate progress. It is pointed out that in this case the two techniques used gave compatible results wherever they were compared.

548 *Julén, G. Practical aspects on tetraploid clover.* (*pp. 471–78*).

It is pointed out that although tetraploid red clover is superior to diploid in certain respects it has several disadvantages, the most serious of which is its low seed-setting capacity [cf. XXVII, 1840]. Details are given of experiments carried out at Svalöf to determine the factors influencing pollination and the effect of an admixture of diploid plants on the seed production of tetraploids.

549 **Australian Plant Nutrition Conference held at University of Melbourne, Victoria, February-March, 1956** (1957) : **2** : Pp. 157. (Mimeographed).

This part of the conference report includes discussions of the papers presented, some of which have been previously summarized [XXVII, 3069–71].

550 Stapledon, R. G.
**Accent on strain.**
Seed Tr. Rev. 1957 : **9** : 143–63.

Among the topics discussed in this general review of herbage plant strains are the danger of paying overmuch attention to germination and purity without considering other aspects, such as adaptability and recovery after grazing or cutting, the influence of the country and place of origin on the subsequent growth of strains, the influence of locality on plant breeding and strain building and the evaluation of strains.

551 Caputa, J.
Le problème des variétés de légumineuses et de graminées fourragères. **(The problem of varieties of forage legumes and grasses).**
Rev. rom. Agric. 1957 : **13** : 57–58.

This topic is briefly discussed with reference to breeding in French-speaking Switzerland.

**Report of the Seventh Meeting of the Western Forage Crops Conference, Forage Crops Division, Central Experimental Farm, Ottawa, Ontario, held at Lacombe, Alta., June 23rd-25th, 1955.** Pp. 161. (Mimeographed).

552 *Heinrichs, D. H. A new alfalfa variety for the prairies.* (*pp. 99–102*).

This variety has already been described from another source [XXVI, 467].

553 *Bolton, J. L. & Downey, R. K. Progress in breeding for resistance to bacterial wilt in alfalfa.* (*pp. 103–04*).

Over 25% of wilt-resistant polycross lucerne lines showed productivity equal to or better than Ladak in their first year at Saskatoon and Lethbridge, and a number were superior to all four commercial varieties used for comparison. It is hoped to use some of these lines in the production of synthetic varieties. A breeding programme designed to combine wilt resistance, quick recovery and the creeping habit was initiated in 1951. Data are provided on the reactions to *Corynebacterium insidiosum* of 30 back-cross lines in a greenhouse test at Lethbridge, Alberta, many of the lines showing over 90% of the resistance of their resistant parents.

554 *Stelfox, H. B. Progress in breeding red clover for resistance to northern anthracnose.* (*pp. 107–08*).

Selections from six varieties and polycross progenies from three of these six are undergoing field trials at Lacombe, Alta., and a study of specific combining ability and the inheritance of resistance to *Kabatiella caulivora* is in progress. Selections resistant to *Erysiphe polygoni* are under trial and three selections of Dollard and one of Ottawa have shown high resistance to both fungi since 1951. The Dollard selections are being used in a polycross trial with three other Dollard selections possessing high resistance to *E. polygoni*. All these selections are without the usual crescent mark on the leaves.

Differences were observed in the growth pattern in culture of isolates of *K. caulivora* from different localities in Alberta. Several of these isolates appeared in preliminary trials to be more pathogenic than others and further studies will be carried out.

555 *Greenshields, J. E. R. & Goplen, B. P. Progress in breeding coumarin-free sweet clover.* (*pp. 109–11*).

A number of lines of *Melilotus* have now been developed which are free from coumarin or have only a low coumarin content. The presence of coumarin is determined by a major dominant gene, *A*, and the type of coumarin, bound or free, by an independent gene *B*. Data are provided on the $F_2$ segregation from crosses among Arctic, *AABB*, Pioneer, *AAbb*, and some coumarin-deficient selections of varying genotype, either *aabb*, *aaBB* or *aaBBccDD*. Further work is in progress. [Cf. XXVII, 1898].

556 *Peake, R. W. Breeding orchard grass—Lethbridge Experimental Station.* (*pp. 113–17*).

The selection of a winter hardy *Dactylis* variety was initiated at the above station in 1938 and progress to date is reviewed in this contribution. Nine selections were established in a polycross nursery in 1951 but of these four showed considerable winter injury. Of the five non-injured lines, one, 85–2, was exceptionally vigorous and this vigour and general desirability have also been shown by its progeny. In tests including European and American lines at other localities in Canada four of the Lethbridge selections gave yields equal to or better than the average and were earlier and more vigorous. The results of this trial are tabulated together with data on the yield, vigour and recovery of the five selected lines and growth ratings of these lines and other strains tested at Lacombe, Alta.

557 **Annual Report of Progress in Forage Crops Research in Oklahoma. Section I. Old World bluestems. Section II. Grass and legume breeding. Section III. Seed production and technology. Section IV. Forage evaluation.**
1956 : Pp. 43; 18; 32; 30. (Mimeographed).

Information is given on the performance of a number of introductions of grasses and legumes. The general survey of the Andropogoneae was continued and information obtained on chromosome numbers and meiotic behaviour in species of *Elyonurus*, *Ischaemum*, *Sehima*, *Hackelochloa*, *Lasiurus*, *Eriochrysis*, *Polytrias*, *Erianthus*, *Rottboellia* and *Andropogon*. Previous observations on *Bothriochloa* and *Dichanthium* were confirmed [cf. XXVII, 593] and other species of these genera investigated.

Crosses involving *Dichanthium*, *Capillipedium* and *Bothriochloa* indicated how widespread apomixis is in the Amphilophiastrae. The $2n = 60$ types appear to be always apomictic, when used as females. Many intra- and interspecific hybrids of *Bothriochloa*, *Dichanthium* and *Capillipedium* were produced, and some are promising. *B. ischaemum* 'Formosa A2582' grew exceptionally well under irrigation.

Breeding for seed set and spikelet production was continued with high yielding sand bluestem (*Andropogon hallii*); the Woodward variety was found more promising than other selected lines. Chromosome counts were made for a number of *Sorghum* species; and they are classified as follows: *Eusorghum* has chromosome numbers in multiples of ten, and the other group, which includes *Parasorghum*, *Stiposorghum*, *Chaetosorghum* and *Heterosorghum*, has multiples of five. The *Halepensia*, a subsection of *Eusorghum*, is most promising for forage. The $F_2$ of *S. sudanense* x *S. propinquus* was grown and many of the progeny showed good drought resistance and some were resistant to *Blissus leucopterus*. Two very promising lucerne plants were discovered and further investigations of these are in progress. Some varieties were found highly resistant to aphids.

Data are provided on seed yield and percentage germination under varying conditions for a number of grasses.

558 Konstantinova, A. M.
**(The use of single plant selection in breeding perennial forage plants).**
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1957 : No. 1 : 32–36. [Russian].

Experiments at several Soviet institutes are said to show that selection of productive forms within populations of *Poa*, *Phleum*, *Bromus*, lucerne and clover inevitably results in decreased yield. Free cross pollination among cultivated varieties or wild populations and Mičurinist training of the hybrid progenies are regarded as the best breeding methods.

559 Beljaeva, Z. S. & Lupaško, I. P.
**(The methods of breeding perennial forage plants).**
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1957 : No. 3 : 68–70. [Russian].

Methods used in Finland, Sweden, the United Kingdom, New Zealand, Canada and USA for breeding grasses and leguminous forage plants are described. The authors conclude that the breeding methods recommended by Konstantinova [cf. 558] are not necessarily the most effective ones.

560 Corriols, M.
Les nouvelles actualités de la production fourragère. **(Current news of forage production).**
Tunis. agric. 1957 : **58 : 71–85.**

This general account includes a list of species recommended for forage. Certain varieties are given special mention. *Festuca arundinacea* '660 Israël', '618 Maroc' and the local form, Grombalia, were noted for their yield and resistance to drought. Wimmera V93 appears to be the most productive of the *Lolium rigidum* varieties tested. Turkish, a variety of *Onobrychis sativa*, is high yielding; 1889 Italy and 1834 Sicily are two varieties of *Hedysarum coronarium* recommended for hay. *Pennisetum clandestinum* 'Kikuyu' is suitable for pasture. Several high-yielding varieties of *Medicago sativa* are noted.

561 Tateoka, T.
**Karyotaxonomy in Poaceae. IV. Chromosomes and systematic relationships of several species.**
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1956 : **69** : 112–17.

Chromosome counts of representative species of *Asperella, Briza, Bromus, Chikusichloa, Cynosurus, Festuca, Lolium, Lophatherum, Melica, Oplismenus, Panicum, Paspalum, Phragmites, Poa, Pogonatherum, Setaria, Sieglingia, Spodiopogon* and *Uniola* are reported and used as a basis for a discussion of taxonomic relationships [cf. XXVII, 1851].

562 Tateoka, T.
**Notes on some grasses. III.**
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1957 : **70** : 8–18.

The leaf anatomy and caryotypes of *Brylkinia schmidtii, Diarrhena japonica* and *D. fauriei* were investigated. *B. schmidtii* has 40 small chromosomes; its taxonomic position appears to lie between *Glyceria* and *Uniola*. Both species of *Diarrhena* have 38 small chromosomes; the affinities of this genus are problematic.

563 Tateoka, T.
**Notes on some grasses. V.**
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1957 : **70** : 115–17.

*Astrebla lappacea* and *A. pectinacea* have 40 small chromosomes. The caryotype and leaf anatomy of these species indicate that *Astrebla* should be assigned to the Chlorideae. [Cf. 562].

564 Tateoka, T.
**Notes on some grasses. VI.**
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1957 : **70** : 119–25.

The caryotypes of the following species are described: *Tripogon japonicus*, $2n = 20$; *Mosdenia phleoides*, 40; *Monerma cylindrica*, 26; *Cleistachne sorghoides*, 36; *Themeda triandra*, 30; *Coelachne japonica*, 40; *Schizachne purpurascens*, 20; *Oryzopsis miliacea*, 24; and *Erharta calycina*, 24. The light thrown by the caryotypes on taxonomic affinities is shortly discussed. [Cf. 563].

565 Shibata, K.
**(Caryotype analysis of several forage grasses).**
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1956 : **69** : 165–68. [Japanese].

The caryotypes of the following grasses are described: *Lolium perenne, L. multiflorum, L. temulentum, Arrhenatherum elatius* and Sudan grass.

566 Bosemark, N. O.
**Further studies on accessory chromosomes in grasses.**
Hereditas, Lund 1957 : **43** : 236–97.

Investigations were carried out on the cytology and transmission of accessories in a natural population of *Festuca arundinacea* from England and in natural populations of *Poa trivialis, Briza media, Holcus lanatus, Alopecurus pratensis* and *Phleum nodosum* collected in Sweden. The sampling was not sufficiently extensive to permit the drawing of conclusions regarding the frequency of plants with accessories in the different species. The percentage of such plants ranged from 54·5 in *F. arundinacea* to 6·9 in *B. media*. In each species the accessories were smaller than the ordinary chromosomes and probably all heterochromatic. Except in *P. trivialis*, the number of accessories was constant in different parts of the same plant. The position of the centromere and distribution of the heterochromatic segments of paired accessories during pachytene were determined in all species. In *P. trivialis*, an end-to-end association was observed at this stage. The amount of pairing at metaphase I varied both intraspecifically and interspecifically. Bivalents were however formed in each species. No pairing between accessories and ordinary chromosomes was detected. Except in *H. lanatus*, univalent accessories remaining between the poles at early anaphase I were capable of dividing during late anaphase I and telophase I. In *H. lanatus*, lagging univalent accessories showed a marked tendency to divide but completely-separated chromatids were not observed. Except in *P. trivialis*, dividing univalent accessories displayed terminal neocentric activity. The degree of meiotic elimination was in general moderate. With the exception of the last-mentioned species and *Ph. nodosum*, accessories underwent nondisjunction, proceeding to the generative nucleus at the first pollen mitosis. Data from intraspecific crosses confirmed the occurrence of directed nondisjunction on the ♂ side in these species.

The author concludes with a general discussion on the origin, genetical effects and selective value of accessories in grasses.

567 Kato, K. & Watanabe, K.
**The stigma reaction. II. The presence of the stigma reaction in intra-specific and inter-generic pollinations in the Gramineae.**
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1957 : **70** : 96–101.

The stigma reaction is a change in the stigmatic cells to which pollen grains have become attached; cells showing the reaction stain deeply with acetocarmine in contrast to unaffected stigmatic cells which remain unstained for a considerable time. The stigma reaction was shown in all instances of intraspecific pollination examined in a series of grasses; it was also shown in all instances of intergeneric pollination within the Gramineae examined, however taxonomically remote the combinations were. The reaction was only rarely shown when grasses were pollinated by pollen from plants of another family.

568 Connor, H. E.
**Breeding systems in some New Zealand grasses.**
NZ J. Sci. Tech. 1957 : **38** : 742–51.

Some indigenous grasses have been investigated. The following gave normal progeny on selfing: *Poa breviglumis, Puccinellia fasciculata, Cockaynea gracilis, Deschampsia caespitosa, Deyeuxia avenoides, D. forsteri* and *Dichelachne crinita. Festuca novae-zelandiae* and *Poa caespitosa* gave degenerate plants. *Poa colensoi, Trisetum antarcticum* and *T. youngii* were found to be self sterile.

569 Tutin, T. G.
**A contribution to the experimental taxonomy of *Poa annua* L.**
Watsonia 1957 : **4** : 1–10.

True-breeding forms of the tetraploid weed species *P. annua*, differing in morphological and physiological characters, were distinguished in material collected in two localities in England. A study of anthesis suggested that the species is autogamous. On the basis of observations on the meiosis and morphology of two tetraploids obtained by crossing the diploid species *P. infirma* and *P. supina* and on meiosis in the triploid hybrids of *P. annua* with each of these species, it is postulated that *P. annua* is an allotetraploid derived from the two diploids. It may have arisen on the northern shores of the Mediterranean during the Quaternary period, possibly on a number of different occasions.

570 Hovin, A. W.
**Bulk emasculation by high temperatures in annual blue-grass, *Poa annua* L.**
Agron. J. 1957 : **49** : p. 463.

The use of high temperatures at the onset of flowering was found to induce anther abortion in five pure lines of *P. annua*, resulting in virtually complete emasculation.

571 Koyama, T.
Contributio ad floram Asiaticam Novam-Guineam inclusem. (**Contribution to the flora of Asia, including New Guinea**).
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1956 : **69** : 209–15.

A diagnosis is included of *Poa finitima*, a new Japanese species related to *P. shinanoana*.

572 Thomson, J. R. & Seaton, R. D.
**Spaced-plant trials at East Craigs. III. Strains of cocksfoot, *Dactylis glomerata* L., 1952-5.**
J. Brit. Grassl. Soc. 1957 : **12** : 209–16.

In trials of 19 strains at East Craigs, Edinburgh, Scotland, habit of growth at ear emergence and at flowering and stem length were found to be related to the date of ear emergence but no relation was found between this character and plant weight, aftermath shooting or spring growth habit. All but one of the strains fell into one of two main groups on the basis of relative earliness or lateness. [Cf. XXVI, 3392 and 3398].

573 **Latar orchardgrass for Pacific Northwest.**
What's New Crops Soils 1957 : **9** : No. 9 : p. 26.

Latar is late maturing, vigorous, winter-hardy and has a low lignin content. It makes good hay with lucerne in fertile well-watered areas. Resistance to leaf spot compares favourably with that of other varieties.

574 Timothy, D. H.
**Evaluations of combining ability in *Bromus inermis* Leyss.**
Diss. Abstr. 1956 : **16** : Publ. No. 17,883 : 2288–89.

The behaviour of six clones and their polycross progenies was compared with the average performance of their single crosses. For reaction to scald and the general effect of foliage disease, polycross data offered a more satisfactory estimate of progeny performance than clonal values. In the case of response to bacterial blight, however, significant differences were not found between clones, single crosses and polycrosses.

With one exception, polycrosses compared favourably with single crosses in respect of vigour. One third of the comparisons for vigour between clones and single crosses differed significantly. Polycrosses and single crosses were similar as regards leafiness, disparities being noted in some cases between clonal and single-cross progenies. Data on aftermath growth did not necessarily correspond in the three types of progeny. Polycross performance gave a better estimate of general combining ability for plant yield and seed yield than clonal or single-cross behaviour. Two-thirds of the comparisons of single crosses with clones and polycrosses for plant height were statistically different. Single-cross performance was predicted by averaging the mean clonal performance of the ♀ and ♂ parents. Correlation coefficients of predicted and observed plant height, seed yield and plant weight were highly significant. Differences between observed and actual values were considered to be due to specific combining ability. "Clones of high, medium and low combining ability were crossed. In general, high x high, high x low, and low x low crosses had progeny of high, medium, or low performance respectively. Good specific combining ability was usually observed when the parents were rated as good combiners."

575 Grissom, D. B.
**Inheritance of combining ability in bromegrass *Bromus inermis* Leyss.**
Iowa St. Coll. J. Sci. 1957 : **31** : 427–28. (Abst.).

Top-cross progenies of 31 $S_0$ clones, ten $S_1$ segregates from 18 of these clones and nine named varieties were evaluated for spring vigour, leaf disease infection and leafiness in one season and for forage yields in two seasons. Statistically significant differences were obtained among top-cross entries, indicating that combining ability for the above four characters is inherited. No difference in combining ability could be shown between generations in respect of spring vigour and leafiness. Segregation for combining ability for forage yield was shown by three families, for spring vigour by ten, for leafiness by seven and for leaf disease rating by one. Heritability estimates gave values of 16, 19, 46 and 48% respectively for leaf-disease reaction, leafiness, spring vigour and forage yield. Correlations between $S_0$ and $S_1$ progeny means ranged from 0·31 for leafiness to 0·65 for two years' average forage yields, while low and variable correlations were obtained between $S_0$ top crosses seeded in swards and previous evaluations of the same clonal families. Almost no correlation was obtained between the performances of $S_1$ top crosses in swards and $S_1$ progenies grown in spaced plantings. Analysis of variance for forage yields and leaf-disease scores showed top crosses of $S_0$ clones to be significantly higher for these characters than $S_1$ top-cross progenies. Inbreeding depression and combining ability for forage yield were positively correlated and a tendency was observed for the lower yielding $S_1$ lines to give the better top crosses. Positive associations were obtained between leaf-disease infection and early spring growth in a study of all possible intercharacter correlations.

576 Camus, A.
*Bromus* hybrides de la flore française.
**(Hybrid *Bromus* of the French flora).**
Bull. Jard. bot. Brux. 1957 : **27** : 479–85.

Brief descriptions of natural and artificial hybrids have been compiled from the literature.

577 Walters, M. S.
**Studies of spontaneous chromosome breakage in interspecific hybrids of Bromus.**
Univ. Calif. Publ. Bot. 1957 : **28** : 335–404.

This is a full account of the author's observations, most of which have been published elsewhere [cf. XXII, 1975, XXIII, 1244, XXIV, 2069 and 3036 and XXVI, 1347]. Chromosome breakage was found to occur more frequently in intersectional hybrids such as *Neobromus* x *Ceratochloa* than in *Ceratochloa* x *Ceratochloa* intrasectional hybrids. Variation in fragment frequency was also found between hybrids, between certain plants of individual hybrid populations, and between the anthers of a plant. It is suggested that groups of genes in *B. trinii* and in species of the section *Ceratochloa* produce breakage when brought together in hybrids. The expression of these primary breakage genes is thought to be affected by the behaviour of secondary genes for which some members of the section *Ceratochloa* are heterozygous. Since chromosome breakage does not appear to be related to other meiotic aberrations, it is suggested that breakage is caused by a specific series of chemical reactions.

Observations on pairing between *B. trinii* and *B. carinatus* chromosomes indicate that partial homology exists between the three haploid genomes of *B. trinii* and the three M-chromosome genomes of *Ceratochloa*. The following genome formulae are proposed: *Neobromus* *trinii*, $A^2A^2B^3B^3B^4B^4$; *Ceratochloa* octoploid species, $A^1A^1B^1B^1B^2B^2LL$.

578 Hill, H. D. & Carnahan, H. L.
**Karyology of natural 4X, 6X and 8X progenies of a tetraploid (4X) clone of *Bromus inermis* Leyss.**
Agron. J. 1957 : **49** : 449–52.

Tetraploids, hexaploids and octoploids were found at State College, Pa., among open-pollinated progenies of a tetraploid clone, $2n = 28$, interplanted with normal octoploid plants, $2n = 56$. Chromosome pairing in the tetraploids and octoploids was usually regular although some stickiness was observed in the octoploids. The hexaploids were characterized by a high degree of sterility and showed up to 14 univalents at metaphase I, bridges and laggards at anaphase I and micronuclei. It is suggested that octoploid *B. inermis* possesses four sets of each of two genomes.

579 MacKay, K. H. & Dunn, G. M.
**Crossing of smooth bromegrass, *Bromus inermis* Leyss, in the greenhouse.**
Agron. J. 1957 : **49** : 359–62.

The seed set from clonal replications, each consisting of a group of ♀ parents emasculated by hot-water treatment and open pollinated by a common ♂ parent, compared favourably with the seed set resulting from crossing under isolation bags. Immersion of slightly immature panicles in water at 46° C. for 5 minutes provided effective emasculation. Satisfactory reproductive isolation of the groups was achieved by transferring them to long days at 70°–80° F. at intervals of about two weeks. The maximum production of panicles was obtained when the clones were previously given short-day treatment for 3 months in a cool greenhouse. The temperature was raised during anthesis in order to control the time of pollination; seed set was increased when the ♀ parents were sprayed with a fine mist before pollination. Cross fertility in the greenhouse was positively correlated with self fertility in the field.

580 Johnson, H. W.
**Lamont, a new variety of rescuegrass resistant to head smut.**
Phytopathology 1957 : **47** : 409–12.

At the Delta substation of the Mississippi Agricultural Experiment Station, Stoneville, *Bromus catharticus* 'Lamont' has shown immunity from collections of *Ustilago bullata* from various parts of the USA, except for a collection from Louisiana to which it was moderately susceptible [cf. XXVII, 4084].

581 Les Ets H. Mommersteeg's Zaadteelt & Zaadhandel, s. a. **(The Seed Production and Trading Establishment of H. Mommersteeg Ltd.).**
Courr. hort. 1957 : **19** : 343–46.

In the description of this Dutch establishment, some breeding work is mentioned. Polyploid races of ryegrass are being produced and artificial mutations induced by colchicine treatment. The high yield of Italian ryegrass has been combined with the winter hardiness and vigour of English ryegrass in a new hybrid.

582 Bosemark, N. O.
**On accessory chromosomes in *Festuca pratensis*. V. Influence of accessory chromosomes on fertility and vegetative development.**
Hereditas, Lund 1957 : **43** : 211–35.

The pollen fertility of plants containing one or two accessories did not differ from that of individuals without accessories [cf. XXVI, 3404]. Higher numbers of accessories had however a cumulatively adverse effect, part of the reduction in pollen fertility probably being due to the formation of restitution nuclei at anaphase I. Vegetative growth was cumulatively reduced in plants with 3 or more accessories. The influence of one or two accessories upon growth may be positive, neutral or negative, depending upon the genotype and environment. Preliminary experiments indicated that the rate and percentage of germination were unaffected by the number of accessories.

583 Wilkins, D. A.
**A technique for the measurement of lead tolerance in plants.**
Nature, Lond. 1957 : **180** : 37–38.

Earlier investigations by Bradshaw suggested that some plants of *Agrostis tenuis* were inherently more tolerant of the lead and zinc in the soil than others [XXII, 2758]. Using plants of *Festuca ovina* collected from different habitats in a former lead-mining area in Scotland, the following technique was developed at the Scottish Plant Breeding Station for the testing of large numbers of plants for lead tolerance. Tillers are rooted in a solution (1 g. per litre) of calcium nitrate and the growth rate is determined when the roots have attained a constant rate of growth. The amount of growth is again measured 4 days after the addition of lead nitrate at a concentration of 25 p.p.m. An index of lead tolerance is obtained from the two growth rates. The whole test is carried out at 70° C., with constant artificial light of about 500 ft.-candles. The five single plants tested showed degrees of tolerance which corresponded to the lead contents of their habitats.

584 GOULD, F. W.
**Pollen size as related to polyploidy and speciation in the *Andropogon saccharoides—A. barbinodis* complex.**
Brittonia 1957 : **9** : 71–75.

A consistent relationship has been found between pollen size and chromosome number in nine species of *Andropogon* at the Texas Agricultural Experiment Station. The range of average pollen size in three species with $2n = 60$ was from 28·9 to 35·1 $\mu$, in five species with $2n = 120$ from 37·1 to 42·3 $\mu$ and in one species with $2n = 180$ the average was 48·5 $\mu$. The bearing of these studies on the problem of speciation in this genus is discussed [XXIII, 2742].

585 CELARIER, R. P.
***Elyonurus argenteus*, a South African grass with five chromosome pairs.**
Bull. Torrey bot. Cl. 1957 : **84** : 157–62.

The above perennial species is regarded as being superior to annual *Sorghum* and *Coix* spp. with $2n = 10$ as material for cytogenetical investigations, since its different chromosomes are easily distinguishable at all stages of meiosis. The chromosome number of *E. argenteus* provides further evidence that the basic number of the Andropogoneae is $x = 5$ and that the tribe is closely related to the Maydeae.

586 SOLOV'EV, B. F.
**(Some questions concerning the breeding and seed raising of sorghum and Sudan grass).**
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1957 : No. 1 : 29–32. [Russian].

Mention is made of the Soviet-bred sorghum-Sudan grass hybrids 5, 1782 and 1958 which are all highly productive of green matter. References are made to the sorghums Gaoljan Koričnevyj 272 [Brown Kaoliang 272], Rannij Jantar' Dnepropitrovskij [Early Dnepropetrovsk Amber] and the Sudan grass varieties Kinel' 90 and Voronež 1; all these are regarded as valuable breeding material on account of their earliness and moderate warmth requirements.

587 KUČUMOV, P. V. & KOVALEVSKAJA, N. I.
**(Sudan grass and sorghum - Sudan-grass hybrids).**
Nauk. pered. Opyt seljsk. Hozjajstv. 1957 : No. 7 : p. 34. [Russian].

A hybrid of Sudan grass and sweet sorghum that yields more than either of the parents and produces sweeter, more palatable fodder than Sudan grass is described. It gave average yields of 810 c. of green matter or 195 c. of hay per ha. in the Ukraine over the two-year period 1955–56, which was 64 c. and 23 c. respectively more than that from Sudan grass.

588 BROWN, W. V. & EMERY, W. H. P.
**Apomixis in the Gramineae, tribe Andropogoneae: *Themeda triandra* and *Bothriochloa ischaemum*.**
Bot. Gaz. 1957 : **118** : 246–53.

These two species were shown to be aposporous apomicts with probable pseudogamous development of the embryos. *B. ischaemum* is thought to be an obligate apomict. The apomictic mechanism is described; it resembles that reported for the Paniceae. The classification of these species in terms of agamic complexes is discussed.

589 YASUE, T.
**(Studies on interspecific hybrids of *Digitaria*. II. $F_1$ plants of *D. ciliaris* Pers. x *D. ischaemum* Muhl.).**
Ikushugaku Zasshi/Jap. J. Breeding 1957 : **6** : 265–71. [Japanese].

Sterile $F_1$ hybrids, more closely resembling the female parent, were obtained from the above cross. They had $2n = 45$ chromosomes, the modal meiotic configuration being $3_{II} + 39_{I}$.

590 TATEOKA, T.
**The place of the genus *Phyllorachis* in the system of Gramineae.**
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1956 : **69** : 83–86.

An anatomical and cytological study has been made of *Ph. sagittata*. The leaf anatomy is of the bambusoid type; there are 24 small chromosomes. These findings indicate that *Phyllorachis* should not be retained in the Paniceae but is best placed, together with *Humbertochloa*, in a separate tribe, the Phyllorachieae. This tribe may have affinities with Oryzeae.

591 WÖHRMANN, K.
Embryologische Untersuchungen zur Kreuzungsmethodik bei *Alopecurus pratensis* L. **(Embryological investigations on crossing procedure in *A. pratensis*).**
Z. Pflanzenz. 1957 : **38** : 77–85.

Isolation and artificial cross pollination of plants of the above protogynous species immediately after emergence of the stigmata resulted in fertilization within 24 hr. followed by embryo and endosperm development, the embryo consisting of several cells by the time the anthers reached maturity some five days later. Studies of further plants showed that the period between female and male maturity varied between 1 and 13 days or, in 86·4% of the plants, between 3 and 9 days. Cross pollination may therefore readily be effected without emasculation.

592 McClure, F. A.
**Bamboos of the genus *Phyllostachys* under cultivation in the United States.**
Agric. Handb. US Dep. Agric. 1957 : No. 114 : Pp. 69.

A key is provided for the field identification, without flowers or fruits, of 24 species and ten cultivars. Each type is fully described.

593 **Primar slender wheat grass.**
Seed Scoop 1957 : **4** : No. 1 : p. 8.

The above variety has been under trial in western Canada for 10 years and has now been licensed. It gives good yields of seed and hay and remains free from smut.

594 Zemljanuhin, A. A.
**(Morphological and physiological descriptions of *Agropyron tenerum* and *A. fibrosum* in connexion with the introduction of the latter).**
Bot. Ž. (Bot. J.), Moskva 1957 : **42** : 230–39. [Russian].

A race of *A. fibrosum* from the Don valley outyielded the standard *A. tenerum* and produced better quality hay in introduction trials at Voronež.

595 Lawrence, T.
**Emergence of intermediate wheatgrass lines from five depths of seeding.**
Canad. J. Plant Sci. 1957 : **37** : 215–19.

In a study of 24 lines of *Agropyron intermedium*, marked differences in percentage emergence from depths of 2 inches and over were found between lines. The size of the grain had no effect.

## LEGUMINOUS FORAGE PLANTS

596 Funke, C.
Über die Chromosomenzahlen der Wurzelknöllchen experimentell erzeugter polyploider Leguminosen. **(The chromosome numbers of the root nodules of experimentally produced polyploid Leguminosae).**
Naturwissenschaften 1957 : **44** : p. 498.

In diploid forms of *Trifolium incarnatum*, *T. hybridum*, *T. pratense*, *Medicago lupulina* and *Ornithopus sativus* the nodule cells were regularly tetraploid and in the respective tetraploid forms the nodule cells were octoploid.

597 Canode, C. L.
**Natural selection within Ranger alfalfa.**
Diss. Abstr. 1956 : **16** : Publ. No. 18,385 : p. 1763.

A sharp intervarietal and intravarietal differentiation in respect to stem growth was expressed with growth in the greenhouse during the short days of autumn and winter at Madison, Wis., and Moscow, Idaho. Plants selected for tall and short stems in these tests responded similarly when transplanted in the field or greenhouse for regrowth under short days. Internodal elongation of plants with short stems was not observed until the day length was in excess of 13 hr.

Seed of Ranger produced in northern latitudes such as Montana consistently gave rise to populations which have lower percentages of plants with tall stems than seed of the same variety grown in southern latitudes such as Arizona. Two generations of seed increase of Ranger in Arizona produced more than double the percentages of tall-stemmed plants under short days in the greenhouse than seed increased for only one generation in the same state. In four field trials in three different localities in the USA, plants selected for tall stems under short days in the greenhouse produced more racemes than plants selected for short stems, irrespective of whether the day lengths during flowering were short or long. In one field trial, in which it was possible to study survival after a severe winter, plants selected for tall stems in the greenhouse under short days were winter-killed to a much greater extent than plants selected for short stems from the same regional seed stocks. It was concluded that, with shorter days during the growing season, tall-stemmed plants of Ranger have greater seed-production potential.

598 Trentin, A.
Per il miglioramento della coltura dell'erba medica. **(For the improvement of lucerne growing).**
Agricoltura d. Venezie 1957 : **11** : 380–88.

Several of the speakers at the conference on the above topic, held at Lonigo, Italy, in June 1957, emphasized the superior adaptation of local strains and the importance of using certified seed of known provenance.

599 La alfalfa, reina de los forrajes. **(Lucerne, queen of fodders).**
Agricultor venezol. 1955 : **19** : No. 178 : 18–19, 42–43.

In this popular article groups of varieties adapted to different climates are described and information on breeding, summarized from a review already summarized [XVIII, 991], is presented.

600 Dudley, J. W. & Wilsie, C. P.
**Inheritance of branched raceme and vestigial flower in alfalfa.**
Agron. J. 1957 : **49** : 320–23.

Investigations referred to earlier [XXVII, 3079] are described in detail.

601 Iversen, C. E.
**Lucerne species and strains.**
Tech. Publ. Canterbury agric. Coll. 1957 : No. **14** : Pp. 16.

After discussing previous taxonomic studies of species of *Medicago* known in the Northern hemisphere the author proposes his own classification of naturally occurring geographical races and bred strains of *M. sativa*, *M. media* and *M. falcata* in the form of a table in which it is possible to give some indication of the degree of hybridization shown by each strain. The distribution and use of the principal strains is then described, emphasis being laid on the characters of greatest agronomic value in each case. Finally, mention is made of the development of creeping lucernes and their potential use in pasture mixtures.

602 Gross, H. D.
**Response of alfalfa varieties to cutting treatment and fertilizers.**
Iowa St. Coll. J. Sci. 1957 : **31** : 428–29. (Abst.).

The following differences between varieties were noted in response to fertilizer treatments: (1) A–224, Buffalo, Grimm and Ladak showed the greatest response to P fertilization, (2) Grimm gave a high positive response to P when cut for hay or cut frequently but Narragansett and Vernal gave high yields only when cut for hay, (3) some varieties showed a greater increase than others in the amount of P or K in the forage after application of these fertilizers, (4) the percentage of P in the forage of Buffalo was increased by K treatment but in all other varieties tested it was decreased, (5) significant differences were found in total P content and in K content under different cutting treatments and when fertilized with P and K and (6) crown number and vigour in the autumn of the second year varied with fertilizer treatment, cutting treatment and variety.

603 Howe, W. L. & Smith, O. F.
**Resistance to the spotted alfalfa aphid in Lahontan alfalfa.**
J. econ. Ent. 1957 : **50** : 320–24.

Lahontan displayed a high degree of resistance in both the seedling and mature-plant stages. Its resistance appeared to be chiefly due to antibiosis and tolerance. Differences between individual seedlings and mature plants with respect to aphid reproduction were observed but those plants on which reproduction occurred were more tolerant of injury than plants of Caliverde and California Common. The resistance of the five parental clones from which Lahontan originated was determined from observations on aphid survival and reproduction on leaves on individually-caged stems. C–84, C–89 and C–900 were classed as highly resistant since aphids placed on them died within 48 hr. Aphids on C–901 and C–902 reproduced but at a slower rate than on the susceptible control California Common. These two clones were classed as intermediate in resistance, C–901 being the less resistant. Injury may be due to a toxin which becomes systemic when injected into the plants; the apparent ability of Lahontan to tolerate the toxin is believed to contribute materially to its resistance.

604 Harvey, T. L. & Hackerott, H. L.
**Spotted alfalfa aphid.**
Circ. Kans. agric. Exp. Sta. 1956 : No. **345** : 21–24.

Crosses have been made between clones of Buffalo lucerne selected on the basis of resistance to *Therioaphis maculata*, with a view to developing a resistant variety with the agronomic characters of Buffalo. In a preliminary test, self-pollinated seed of resistant selections gave 75% resistant progeny compared with less than 1% from self-pollinated susceptible plants.

605 **Resistant varieties check alfalfa aphids.**
What's New Crops Soils 1957 : **9** : No. 8 : 21–22, 29.

The New Mexico Agricultural Experiment Station reports that Lahontan, New Mexico Common and Hardistan lucerne possess some resistance to *Therioaphis maculata*. A synthetic variety, New Mexico 16, has been developed from four strains from these three varieties [XXVII, 1373] and progress is being made in the incorporation of disease resistance into Caliverde and Africa.

606 Musatova, V. I. & Ponomarčuk, D. M.
**(The hybrid clover variety Severjanin).**
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1957 : No. 2 : 47–48. [Russian].

Severjanin [Northerner] was obtained by open pollination of the wild form from the Pečora basin with the land varieties Perm' and Jaroslavl'. It combines the hardiness, earliness, longevity and resistance to excessive moisture of the wild form with the improved vigour and productiveness of the other components.

607 NUTMAN, P. S.

**Symbiotic effectiveness in nodulated red clover. III. Further studies on inheritance of ineffectiveness in the host.**

Heredity 1957 : **11** : 157–73.

A second recessive gene (*ie*) causing symbiotic ineffectiveness in plants inoculated with effective strains of *Rhizobium trifolii* has been found in late-flowering Montgomeryshire red clover [cf. XXIV, 3075–6]. In contrast to the gene $i_1$ discovered previously, *ie* is not markedly specific with respect to bacterial strain and may be only partially suppressed by host modifiers. With outstandingly effective strains, *ie* homozygotes give a mixed response, whereas with other effective strains they show a uniformly ineffective reaction. The two genes also differ in the size and number of ineffective nodules produced. No variants of the Rothamsted test strain A were found to which *ie* homozygotes responded effectively.

608 BERGERSEN, F. J. & NUTMAN, P. S.

**Symbiotic effectiveness in nodulated red clover. IV. The influence of the host factors $i_1$ and *ie* upon nodule structure and cytology.**

Heredity 1957 : **11** : 175–84.

The $i_1$ type of ineffectiveness was due to failure of the infecting bacteria to produce bacteroids; this failure was observed only in the case of bacterial strain A. In the *ie* type, abnormal divisions of the host tissue took place in the vicinity of bacteria which had been released from infection threads; a disorganized tumour-like growth in which no bacteroids were produced was thus developed. Tumorization in *ie* nodules occurred in response not only to strain A but also to other effective strains. With strains prone to be exceptionally effective on unselected red clover, varying degrees of effectiveness upon *ie* plants were expressed; nodule structure was normal in cases of fully effective response whereas partially effective nodules contained both normal and tumorized tissue.

609 DEWEY, D. R.

**Combining ability and related studies of selected lines of red clover, *Trifolium pratense.***

Diss. Abstr. 1957 : **17** : Publ. No. 20,508 : p. 715.

General and specific combining ability for yield of six $S_2$ and five $S_0$ lines were studied in spaced plantings of progenies of diallel single crosses within these two groups. Each $S_2$ line consisted of the selfed progeny of a single $S_1$ plant while each $S_0$ line comprised the open-pollinated progeny of the $S_1$ plant from which the corresponding $S_2$ line was derived. The lines differed markedly in general combining ability. Five of the 15 single crosses between $S_2$ lines and 4 of the 10 single crosses between $S_0$ lines showed specific combining ability for total forage yield. Low specific combining ability was shown only in crosses which had at least one parent low in general combining ability. Relationships between the following progenies with respect to yield were determined: (1) single-cross progeny of 8 $S_2$ lines, (2) open-pollinated progeny of the same $S_2$ lines, (3) single-cross progeny of seven $S_0$ lines, (4) open-pollinated progeny of the same seven $S_0$ lines and (5) the six varieties from which the lines were derived. No significant associations were found between the yields of any of the progenies at the first cut. In the case of second-cut yield and estimated relative yield, correlations between (1) and (2) were greater than those between (3) and (4). Correlation between (1) and (3) was "of approximately the same magnitude as the correlation single-cross and open-pollination progeny yields". No association was found between (1) and (5). Estimates of general combining ability from mean single-cross yields at the second cut showed good agreement with estimates from mean yields of open-pollinated progeny at this cut, and also with estimated relative yield. None of the parent-progeny correlations for vigour were significant. Seedling vigour in the greenhouse was significantly associated with forage yield at the second cut and with estimated relative yield. The lack of association between first-cut yield and seedling vigour, second-cut yield or estimated relative yield was probably due to differences in establishment at the first cut. Erect plants and individuals with small lax crowns failed to overwinter. Selection of plant types may be useful in improving winter hardiness.

610 SHERWOOD, R. T.

**Physiologic races of the red clover leaf rust fungus.**

Phytopathology 1957 : **47** : 495–98.

It has been found possible to distinguish five races of *Uromyces trifolii* var. *fallens* by their pathogenicity to selected individual plants of six differential varieties, in tests at Cornell University, Ithaca, NY.

611 **Wisconsin synthetic red clover for Northeast.**
What's New Crops Soils 1957 : **9** : No. 9 : p. 27.

This new variety was found superior to other leading varieties in yield and resistance to *Colletotrichum trifolii.*

612 Quinlivan, B. J.
**Strains of subterranean clover in Western Australia.**
J. Agric. W. Aust. 1957 : **6** : 343–55.

The origin of Western Australian strains is discussed and those strains which occur naturally under field conditions are described.

613 Vizer, J.
A baltacimról. (**On sainfoin**).
Agrártudomány 1956 : **8** : 343–45.

Both *Onobrychis viciaefolia* and *O. arenaria* occur in Hungary, as well as transitional forms, and it is thought that the former species has been derived through selection from the latter. In breeding, *O. vicaefolia* is chiefly used, Kompolt being an improved strain of a Persian variety; it is tall and erect with good winter hardiness and resistance to frost and drought. *O. arenaria* and *O. montana* are being used in breeding for sandy soils and mountain districts. Breeding aims include the production of a hardy, double-cut variety resistant to shattering.

614 Jalas, J.
Rassentaxonomische Probleme im Bereich des *Anthyllis vulneraria* L.-Komplexes in Belgien. (**Problems of racial taxonomy within the *A. vulneraria* complex in Belgium**).
Bull. Jard. bot. Brux. 1957 : **27** : 405–16.

The work which has been already done in this field is discussed. Four subspecies are recognized and suggestions are made for provisional subdivisions within these groups.

615 Goplen, B. P., Greenshields, J. E. R. & Baenziger, H.
**The inheritance of coumarin in sweet clover.**
Canad. J. Bot. 1957 : **35** : 583–93.

The following varieties of *Melilotus alba* were used: Arctic (containing bound coumarin), and coumarin-deficient strains derived from (*M. dentata* x *M. alba*) x *M. alba* by further back crossing with *M. alba* strains. The cross of free-coumarin x bound coumarin plants indicated that the character of bound-coumarin was controlled by a recessive gene, *b*. In crosses of high-coumarin x coumarin-deficient plants the $F_1$ progeny were intermediate for coumarin content and the $F_2$ indicated that coumarin production is controlled by one partially dominant gene, *Cu*. The gene *B*, responsible for free coumarin, is undetectable in plants homozygous for *cu*. Variation in the coumarin content of high coumarin plants may be due to nonheritable characters or genetic factors not yet detected.

616 Micke, A.
Eine vereinfachte Methode zur Prüfung von Steinklee-Individuen auf Cumarin. (**A simplified method of testing sweet-clover individuals for coumarin**).
Züchter 1957 : **27** : 179–81.

Leaves that had been slightly wounded when treated with a 10% solution of NaOH showed a strong yellow-green fluorescence when coumarin was present. In this way coumarin-free plants can be selected in the four-leaf stage before planting out, so saving a great deal of time and labour in planting out seedlings that will later have to be discarded. Dry seeds can be tested by moistening with a 0·5–0·2% solution of NaOH for up to 5 min., which does not impair their germinating capacity. The light for the radiation was produced by the combined use of Schott UC2 and BG23 filters.

617 Eliasson, S.
Försök med sötlupin. (**Trials of sweet lupin**).
Medd. Jordbruksförs. 1957 : No. 82 : Pp. 25.

In the sections describing the results of strain trials carried out in Sweden during the period 1942–54, it is shown that yellow lupins have a higher dry matter content than blue lupins and are therefore to be preferred for silage; only the yellow variety Neven was superior to the blue in crude protein yield. In tests of suitability for ripe harvesting, differences in seed yield were not significant, but the yellow lupins were higher in crude protein content and lower in 1000-grain weight.

618 Bragdø, M.
**Interspecific crosses in *Lupinus*. Cytology and inheritance of flower colour.**
Hereditas, Lund 1957 : **43** : 338–56.

In $F_1$ hybrids of *L. polyphyllus* x *L. arboreus*, *L. polyphyllus* x Russell lupin, *L. nootkatensis* x *L. arboreus* and *L. nootkatensis* x Russell lupin, meiosis was regular, $24_{II}$ being formed. Cyanic *vs.* acyanic flowers depended upon one pair of genes, *Aa*. In *L. polyphyllus*, *L. polyphyllus* x Russell lupin and *L. nootkatensis* x Russell lupin bluish *vs.* reddish flowers were governed by *Bb*. White *v.* yellow colour segregated monogenically in some progenies of *L. polyphyllus* x Russell lupin and of crosses within Russell lupin; possible causes of deviations are discussed. The results of a chromatographic analysis of anthocyanins in the flowers of Russell lupin and its last-mentioned hybrid are included.

619 Peacock, H. A. & Wilsie, C. P.
**Selection for resistance to seed pod shattering in birdsfoot trefoil (*Lotus corniculatus* L.).**
Agron. J. 1957 : **49** : 429–31.

Data are provided on the seed-pod shattering of selected groups, synthetics and varieties of *L. corniculatus* and of diallel and reciprocal crosses and open pollinated progeny of four clones selected for their resistance to shattering at the Iowa Agricultural Experiment Station. Seed-pod dehiscence was reduced by 17% in one cycle of selection.

620 Mohlenbrock, R. H. (Jun.)
**A revision of the genus *Stylosanthes*.**
Diss. Abstr. 1957 : **17** : Publ. No. 20,758 : p. 732.

The 125 species, subspecies, varieties and forms which have been ascribed to the above genus were reduced in this study to 25 taxa. The genus was divided into two sections based on the presence or absence of a rudimentary floral axis. Other characters found to be of diagnostic value included the shape and size of the loments.

621 Davies, A. J. S.
**Successful crossing in the genus *Lathyrus* through stylar amputation.**
Nature, Lond. 1957 : **180** : p. 612.

Viable seeds have been produced from the crosses *L. cicera* x *L. sativus*, *L. clymenum* x *L. ochrus*, *L. clymenum* x *L. articulatus* and the reciprocal, *L. articulatus* x *L. ochrus*, *L. hirsutus* x *L. odoratus* and the reciprocal and *L. sylvestris* x *L. latifolius* in the Department of Botany, University of Manchester. In crossing *L. odoratus* with *L. hirsutus* complete removal of the style followed by pollination of the cut stump gave the best results, although fertilization sometimes took place when only part of the style was removed. To avoid emasculation damage, pieces of the culms of various grass species were generally fitted over the styles of unopened flowers so as to exclude the anthers, leaving one end protruding from the keel. When the flower was open, pollen was pushed down the culm on to the stigmatic surface.

622 Larsen, K.
**Cryptospecies in *Lathyrus pratensis*.**
Bot. Tidsskr. 1957 : **53** : 291–94.

Studies of diploid ($2n = 14$) and tetraploid ($2n = 28$) forms have shown that morphological variation is greater within than between the two chromosome races, which can thus be distinguished only by counting the chromosomes. The tetraploid occurs in more southerly regions than the diploid, having a Mediterranean-Atlantic distribution.

623 Menezes, O. B. de & Nunes, W. de O.
Esterilidade em jacatupê (*Pachyrrhizus bulbosus* L.). [**Sterility in the yam bean (*P. bulbosus* L.)**].
Ceres, Minas Gerais 1956 : **10** : No. 55 : 52–57.

Considerable segregation was observed on inbreeding *P. angulatus* and *P. bulbosus*. Pollen fertility in the interspecific hybrid averaged 16·07%.

## ROOTS AND TUBERS

624 Krasočkin, V. T.
**(Form development in beet).**
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1957 : **31** : No. 2 : 57–87. [Russian].

A study of the wild species of *Beta* suggests that *B. maritima* stands nearest to the prototype from which the cultivated beets have arisen. At one extreme it has given rise to *B. orientalis* which behaves as an annual in almost all areas in the Soviet Union, except when the day length is artificially reduced to 6–9 hr.; experimental results show that the vernalization and light stages are both extremely short in this species. At the other extreme are the wild beets of Scandinavia, which by natural selection, probably from wild Mediterranean beets, have developed extremely long vernalization stages, self fertility and great morphological uniformity. The effect of selection in changing the biological characteristics of a species was shown by experiments with Tunisian leaf beets sown at Majkop; seed from plants that flowered in the first year gave rise to a progeny in which most of the plants flowered; seed from plants that flowered only in the second year gave a progeny in which none of the plants flowered the first year.

In view of the caryological differences between *B. vulgaris* and the wild species it is thought improbable that cultivated beetroots arose from wild species by hybridization and the root beets are thought to have originated by selection from annual leaf beets, which had already been taken into cultivation; ancient forms still present in Central Asia, Asia Minor and Afghanistan represent such intermediate stages and are characterized by short vernalization phases and a strong tendency towards bolting; Mesopotamia is considered to be the area where this selection process first started. Experiments are mentioned in which Swiss chards, when grown under very favourable conditions at Majkop, showed considerable enlargement of the roots, although in the less favourable conditions of Leningrad this did not occur. In selecting the plants with the greatest tendency towards root production, a selection towards the biennial habit was unconsciously effected. This occurred in Asia Minor, Transcaucasia and the Mediterranean basin, mostly in localities at a high altitude with a cool growing season, and took place before the beginning of the Christian era; in these areas a great diversity of primitive forms is encountered even today. In northern Europe the process did not take place till the 14th-16th centuries AD. The next stage was the selection of the sugar beet from mangels in the eighteenth century, the mangels of that time being much closer to the leaf beets than those of today; northern forms of *B. maritima* probably also contributed by hybridization.

The long-petioled beets endemic in certain areas of Asia Minor have apparently evolved under conditions of mixed cropping with lucerne or cotton. The red beets seem to have originated in Transcaucasia; in Abhazia a number of primitive forms are still found in which the root pigment contains an admixture of yellow pigments and yellow forms can arise by segregation from the red forms; conversely red forms can arise in crosses of yellow with white forms.

625 HELM, J.
Versuch einer morphologisch-systematischen Gliederung der Art *Beta vulgaris* L. **(An attempt at a morphological and systematic classification of the species *B. vulgaris* L.).**
Züchter 1957 : **27** : 203–22.

A classificatory scheme and revision of nomenclature of *B. vulgaris* is presented; keys to identification and descriptions of the five subspecies *maritima*, *orientalis*, *lomatogonoides*, *macrocarpa* and *vulgaris* and of the varieties, convarieties, provarieties and forms of ssp. *vulgaris* being included. The convar. *vulgaris* includes the leaf beets and chard while convar. *crassa* covers mangels, beet root and sugar beet.

626 SMIRNOV, M. N. & OS'MAKOV, I. G.
**(Sowing forage root crops with hybrid seed).**
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1957 : No. 2 : 31–33. [Russian].

Experiments at the Forage Institute showed that, by sowing hybrid mangels, increases in root yield amounting to 55–108 c. per ha. were obtained and increases of dry matter of 10–24·5 c. per ha. The hybrids which had Eckendorf Yellow as the mother parent were the most productive. Similar data on yield increases in hybrids of mangel x sugar beet and in swede hybrids are also given.

627 MILDNER, E.
Warum wurde die Kohlrabisorte 'Prager Trieb Weisser' aus der Sortenliste der DDR gestrichen? **(Why was the kohl rabi variety Prager Trieb Weisser deleted from the varietal list of the German Democratic Republic ?)**
Dtsch. Gartenbau 1957 : **4** : 150–51.

Two new varieties, Knaufs Frühweiss [Knauf's Early White] and Erfordia, designed to replace Prager Treib Weisser [Prague Forcing White], show less tendency to bolt, are earlier and produce a higher proportion of top-quality marketable globes.

628 THIJN, G. A.
Aardappelveredeling en daglengte. **(Potato breeding and day length).**
Meded. Ned. Alg. Keuringsdienst Landbouwzaden Aardappelpootgoed 1957 : **14** : 46–48.

Day-length reaction appears to depend on a large number of factors, crosses between early varieties giving progeny consisting largely of seedlings with a high critical day length, suitable for cultivation in the Netherlands, while crosses between late varieties tend to give progeny with a low critical day length resulting in early flowering and little tuber formation; crosses between early and late potatoes give intermediate progeny. Seedlings with a low critical day length may be recognized and rogued early if grown under 16-hour photoperiods, since under these conditions they tend to form stolons above the ground.

Vědecké zasedání I. odboru CSAZV o pěstování a šlechtění bramborů. **(A scientific conference of the first Section of the Czechoslovakian Academy of Agricultural Sciences on the cultivation and breeding of potatoes).**
Věstn. čsl. Akad. zeměd. Věd. 1956 : **3** : 497–560.

629 *Zadina, J. Metody a cíle šlechtění bramborů v ČSR. (Methods and aims in potato breeding in the Czechoslovakian Socialist Republic). (pp. 499–504).*

Mention is made of new early varieties resistant to *Synchytrium,* in particular the varieties Ambra and Jara [Spring]. Most Czechoslovakian varieties proved resistant to the common biotypes of this microorganism and such varieties as Tábor and Blanik also to the new G strain from Germany.

A series of varieties, mostly hybrids between domestic varieties and wild species such as *Solanum demissum,* have shown resistance to *Phytophthora infestans,* but some varieties hitherto regarded as blight-resistant were susceptible to new virulent *Phytophthora* strains discovered in 1953.

Hindenburg, Jubel, Ostragis, Carnea, Kardinál [Cardinal], Kotnov, Blanik and some other varieties proved resistant to virulent strains of *Streptomyces scabies* with which they were artificially infected.

Jubel and Arnica were among the varieties found to be resistant to *Spongospora subterranea.* Breeding for resistance to *Rhizoctonia solani* (*Pellicularia filamentosa*) was abandoned as no resistant material was found. Wild species and forms are being used in hybridization work for imparting resistance.

Some wild species and forms proved lethal to larvae of *Leptinotarsa decemlineata.*

Distant hybridization involving *S. andigenum* or *S. demissum* is envisaged as the principal method of breeding for high starch content and the German varieties Robusta, Roswitha, Fram and Herulia are cited as examples of achievements in breeding work along these lines.

In the course of a discussion, which followed the principal reports, Schick (Germany) listed some varieties resistant to wart or physiological degeneration.

630 Gern, A. P.
**(For varieties of full value).**
Kartofel' (Potato), Moskva 1957 : No. 2 : 34–39. [Russian].

Observations at the Petrovskaja Breeding Station on varietal differences in the potato with regard to yield, growth and dormancy periods, starch, protein and ascorbic acid contents, flavour, tuber shape and resistance to wart, *Phytophthora* and other diseases form the basis for a discussion on breeding new varieties.

631 Katin-Jarcev, L. V.
**(Breeding the potato for earliness).**
Kartofel' (Potato), Moskva 1957 : No. 2 : 47–50. [Russian].

Severjanin [Northerner] and Sedov were both bred from Early Rose 1830 x Katahdin at Omsk. They are early, productive, tolerant of high temperatures during the period of tuber formation and show good yield responses to irrigation and fertilizers. The tubers of Sedov contain 2·77% protein.

632 Jeanneau, Y.
Conclusions pratiques sur quelques essais de cultures maraîchères de primeurs. **(Practical conclusions on some market-gardening trials with early vegetables).**
Pomme d. Terre franç. 1957 : **20** : No. 217 : 19–22.

Some early varieties of potato are recommended for cultivation in west Algeria; it is suggested that Sientje should replace Étoile de Léon [Star of Léon].

**The National Potato-Breeding Program, 1956.**
US Dep. Agric. 1957 : Pp. 225. (Mimeographed).

Many of the contributions deal solely with yield trials of varieties and seedlings in 1956 and are here omitted. Seedlings which have reached the status of commercial release are noted in Absts. 633, 646, 650, 656 and 658.

633 *Akeley, R. V. National potato-breeding program, 1956.* (*pp. 1–3*).

A short survey is given of outstanding results of tests on seedlings and varieties for yield and total solids, the main features of new varieties released (Variety 43 in Alaska, Tawa and Onaway), and progress in interspecific hybridization, in research connected with the late-blight problem and in breeding for resistance to nematode, leaf roll, virus Y, scab, ring rot and *Verticillium* wilt.

*United States Department of Agriculture*

634 *Akeley, R. V.* et al. *Plant Industry Station* (*Beltsville, Md.*) *and Chapman and Aroostook Farms* (*Presque Isle, Maine*). (*pp. 4–17*).

Hybridization designed to develop varieties with multiple resistance to diseases and pests continued, with more emphasis on resistance to ring rot and nematode. A list indicating the pedigrees and characteristics of selections used as parents is provided. B3139–24 and B3516–11 proved to be particularly valuable as parents. The former is resistant to scab, *Verticillium* wilt, ring rot and virus Y, the latter to late blight and *Verticillium* wilt.

Seedling 927–3 is noteworthy for its freedom from net necrosis, yielding ability and resistance to leaf roll. In a test of scab resistance, several older parents such as Ontario, B2331–5, B2359–84, B2834–3, B3097–82 and B3139–24 developed only a trace of type–1 pustules (small and superficial).

635 *Akeley, R. V., Schark, A. E. & Bonde, R. Variety test in wilt-infested soil.* (*pp. 17–18*).

As in the previous three years, 792–94, 792–88 and 41956 showed most resistance to *Verticillium* wilt at Caribou, Me. Yield and infection were again not correlated. Dry-matter percentage and incidence of wilt were in most cases inversely related.

636 *Akeley, R. V., Schark, A. E. & Bonde, R.* Verticillium *wilt resistance.* (*pp. 18–19*).

About 21% of 382 selections representing 26 family lines were free from wilt at Caribou, Me. B3952 (X792–88 x Ac.25976) was the only family completely without symptoms.

637 *Buck, R. W. (Jun.) & Akeley, R. V. Late blight resistance.* (*pp. 19–20*).

Seedlings from 30 crosses and 3 selfed lines were inoculated with 4 races of *Phytophthora infestans*. This material involved parents immune from one or more races. A survival percentage of 57·2 was obtained. Resistant seedlings were also selected from crosses and a $BC_1$ of (*Solanum demissum* x 2*n* species) x Katahdin.

638 *Buck, R. W. (Jun.).* Solanum *species and hybrids.* (*p. 20*).

Interspecific hybridization at Beltsville, Md., is briefly reported. $F_1$ seed was secured from 13 4*n* x 2*n* combinations. Most $F_1$ hybrids between 2*n* species were completely ♂ sterile but usually set seed when back-crossed as ♀ to one or both parents. Some induced tetraploids of 2*n* species and interspecific hybrids produced seed when pollinated with Katahdin. Hybrids belonging to series *Pinnatisecta* and *Cardiophylla* were however sterile when crossed with Katahdin. Tetraploids from crosses of late-blight resistant clones of *S. demissum* with 2*n* species were successfully crossed with cultivated varieties.

639 *Webb, R. E.* et al. *Potato disease investigations.* (*pp. 21–28*).

The results of tests of selections and varieties for reaction to late blight, viruses X, Y and A, leaf roll and *Verticillium* wilt are reported. Field evaluation of multiple-gene resistance to late blight was closely correlated with evaluation under greenhouse conditions in West Virginia. A large percentage of selections immune from virus X may be expected from parents immune from this disease; many such parents are immune or highly resistant to other diseases. Some parents confer a high degree of field resistance to virus Y upon their progenies. In the greenhouse 44% of the seedlings tested were graft-immune from virus A. Under field conditions 62% of the seedlings were not infected. Reinoculation of graft-susceptible clones by means of aphids revealed that 11% were highly resistant or immune from aphid infection with this virus. Greenhouse screening followed by field tests of the survivors has proved to be a highly satisfactory method of evaluating resistance to *Verticillium* wilt [cf. XXVII, 4136].

640 *Frutchey, C. W., Binkley, A. M. & Schaal, L. A. Potato seedling and new variety testing at Fort Collins, Colorado, 1956.* (*pp. 29–34*).

Notes are given on experimental varieties chosen for further testing.

In a test of selections for scab reaction in the San Luis Valley, CS14976 was outstanding for its resistance.

641 *Hougas, R. W. & Ross, R. W. Inter-regional potato introduction project.* (*Co-operative project of the 48 states and the Plant Introduction Section ARS*). (*pp. 35–36*).

The following introductions are mentioned as being of particular interest: selections of *S. andigenum* and *S. andigenum* x *S. tuberosum* field-resistant to late blight and virus-resistant selections of *S. rybinii* from Colombia, and the reputedly drought-resistant species *S. anomalocalyx* and *S. vallegrandense* from Bolivia.

A cooperative project has been initiated between the Horticultural Crops Research Branch of the USDA and the Wisconsin Agricultural Experiment Station with the aim of bridging the gap between the Inter-Regional Potato Introduction Project and the work of state and federal investigators. Designed to coordinate evaluation of the tuberous *Solanum* spp., the new project will be concerned with the study of introductions with respect to disease reactions, chromosome numbers, general breeding behaviour and crossability with *S. tuberosum*.

642 *Kehr, A. E.* et al. *North Central Regional Trials* 1956. (*pp. 37–46*).

ND2906–1R received the highest overall rating for yield and other characters; Redbake was second [cf. Abst. 658]. The more scab-resistant entries included Wis.0103.51, BE2335–42, I911–2 and ND2906–1R. Notes are given on the outstanding features of selections found valuable as parents in breeding in several states.

643 *McLean, J. G. Pacific Northwest. (pp. 47–51).*
The results of tests of lines and varieties for resistance to scab, leaf roll and *Verticillium* wilt in Idaho are reported.

644 *Dykstra, T. P. Southern project (Louisiana headquarters). (pp. 52–56).*
Information is given on yields of seedlings from Tennessee in Louisiana. Methods of testing for reactions to late blight and scab and varying success in crossing in different years are commented upon.

645 *Edmundson, W. C. U.S. - Colorado Potato Field Station, Greeley, Colo. (pp. 57–59).*
Breeding to develop red and white varieties with scab resistance and improved cooking quality continued.

### *Alaska*

646 *Dearborn, C. H. (p. 60).*
Introduced material and seedlings from Alaskan crosses were screened for scab resistance and other characters.
A variety developed from Minn.114.42–3–44 x X792–94 is being released primarily for domestic cultivation. It has high dry-matter content and is free from blackening when cooked.

### *California*

647 *Davis, G. W. (pp. 61–65).*
As in 1955, seedlings 3457–2, 3456–2 and 3458–12 were outstanding in scab resistance. Crosses were effected in which Menominee and 3457–2 were used as scab-resistant parents and White Rose as the desired commercial type.

### *Canada*

648 *Parks, N. M. (pp. 66–68).*
A report is given on the performance shown in several respects by named varieties developed in the USA, when tested at four stations in Canada.

### *Indiana*

649 *Erickson, H. T. (p. 78).*
The russet type I911–7 possesses complete resistance to scab combined with good quality. It equals Irish Cobbler in yield but is somewhat later in maturity.

### *Iowa*

650 *Kehr, A. E., Horton, J. & Manzer, F. (pp. 79–86).*
Further crosses were effected in breeding for combined resistance to several diseases. In breeding for late-blight resistance, use is being made of dominant genes from *S. demissum* and also recessive genes conferring field tolerance of all races. The possibility of distinguishing the two types of resistance by means of peroxidase determinations and of measuring the degree of minor-gene resistance is being explored. A selection of *S. antipoviczii* x *S. tuberosum* (Iowa S4004) was reported to be immune from late blight in Haiti, where all other resistant lines were killed, including those resistant to races 0, 12 and 14.
Some selections showed no symptoms of leaf roll and may be of immediate value as varieties or useful as parents.
A new project has been initiated to study the applicability of inbreeding and crossing of inbreds.
I803–3 (B595–76 x B76–23) was released as Tawa [cf. 684].

### *Louisiana*

651 *Miller, J. C. & King, J. R. (pp. 88–92).*
Hybridization to develop white and red skinned varieties continued. The following seedlings are singled out for mention as high yielders: 91–143, white skinned and resistant to scab and late blight; the pink seedling 1859; and 91–78, early maturing and with good quality for crisp manufacture.

### *Maine*

652 *Bonde, R., Akeley, R. & Merriam, D. Development of commercially desirable ring-rot-resistant varieties. (pp. 93–96).*
Some crosses between parents resistant to ring rot produced progenies with relatively high percentages of resistant seedlings. Parents used in 1956 were also tested: Merrimack, B355–24, B355–44 and B3097–82 did not become infected. Of the ring-rot resistant seedlings tested for yield, B721–29 (Earlaine x Teton), B2854–1 (B721–29 x Furore) and B3141–3 (B721–29 x Teton) gave significantly higher yields than Katahdin, the variety grown most widely in Maine.

653 *Bonde, R., Simpson, G., Akeley, R. & Merriam, D. Selection of desirable seedlings for the leaf roll resistance breeding program. (pp. 96–98).*
B24–58 (Imperia x Earlaine) is noteworthy for its high degree of resistance to both aphid and leaf roll and its superiority in yield over other seedlings and Green Mountain. It has been used extensively as a parent.

654 *Simpson, G. W., Bonde, R., Akeley, R. V. & Merriam, D. Leafroll-resistant seedlings. (pp. 101–03).*
The reactions of selfed lines and progenies of

crosses to leaf-roll inoculation by aphids are reported.

*Mexico*

655 *Niederhauser, J. S., Cervantes, J. & Graham, K. Report on 1956 Toluca (Mexico) field test for late blight resistance of seedlings sent by Robert V. Akeley. (pp. 110–11).*

Most of the 2771 USDA seedlings tested were severely blighted or killed, only seven showing slight infection. Of these resistant seedlings, five were members of family B4215 (3VW–9 x Ac.25959).

*Michigan*

656 *Wheeler, E. J. & Moore, H. C. (p. 112).*

Seedling B69–17 was released as Onaway. In time of maturity similar to Irish Cobbler, it is highly resistant to scab and in a limited test has shown field resistance to late blight. Its parentage is Katahdin x 96–56 (3895–13 x Earlaine), 3895–13 being a blight-resistant derivative of one of Müller's W varieties.

*Minnesota*

657 *Krantz, F. A.* et al. *Field resistance to late blight. (pp. 113–17).*

Preliminary investigations indicated that an appreciable degree of field resistance exists in *S. tuberosum* clones equal in other characters to commercial varieties. Most clones equal or superior to Pontiac in field resistance to blight were also resistant to scab. Blight races 1,2 and 1,2,4 were found for the first time in Minnesota. Parents used most frequently in crossing during 1956 included 69.49–4.51, 55.50–26–52, 71.48–4–50 and 50.49–7–51, equal to Hindenburg in scab resistance, and Minn. 355 and 58–2–4, combining earliness with field resistance to blight.

*Nebraska*

658 *Werner, H. O., O'Keefe, R., Dinkel, G. J., Miyoshi, R. & Harris, L. (pp. 122–34).*

Notes are given describing promising advanced red-skinned and white-skinned selections; the latter are scab resistant. Redbake (26.44–1) was released [cf. XXVI, 2545].

Red-skinned lines highly resistant to scab have been developed; 114.51–2 and 156.52–2 may be of immediate commercial value. Probably Hindenburg and Menominee were the sources of the scab resistance of 114.51–2 and, together with Jubel, also of 156.52–2.

Advanced lines were tested for heat resistance by subjecting greenhouse-grown plants to a stream of hot air (133–135° F.) for 4 hr. and determining survival 24 hr. later. Lines differed widely in endurance. The possibility of a relationship between differences in root/top ratio and disparities in heat tolerance among lines is being determined.

As part of the cooperative project of improvement by means of inbred parents [cf. XXVII, 3155], lines homozygous for resistance to scab and to heat and drought are to be developed.

*New York*

659 *Peterson, L. C. & Alfieri, S. A. (pp. 148–49).*

Many of the seedlings developed combined resistance to more than one of such diseases as late blight, scab, black spot and nematode.

Introductions of *S. andigenum* from Europe, *S. sucrense* and colchicine-induced polyploids of *S. vernei* have been used as parents in breeding for nematode resistance.

*North Carolina*

660 *Haynes, F. L. (p. 150).*

An attempt is being made to use *S. pinnatisectum* as a source of brown-rot resistance. Since crosses with *S. tuberosum* have failed, the possibility of transferring resistance by means of an intermediate species is being explored.

One breeding line accumulated reducing sugars at less than half the rate shown by four commercial varieties during storage at 60° F.

*North Dakota*

661 *Hoyman, W. G. (pp. 153–59).*

Testing of selections for reaction to scab, late blight and other diseases is reported.

662 *Johansen, R., Sandar, N. & Lana, E. P. (pp. 160–69).*

Progress in breeding for disease resistance is summarized. In breeding for resistance to virus Y the value of ND457–1 is being investigated [cf. XXVI, 2550].

*Ohio*

663 *Sleesman, J. P. (pp. 174–75).*

Emphasis has been placed on the development of a leaf-hopper resistant variety. Interspecific hybrids involving *S. chacoense*, *S. schickii*, *S. gibberulosum*, *S. macolae* and *S. boergerii* were especially resistant.

*Pennsylvania*

664 *Grunn, P. & McHugh, D. Nature of the reproductive isolations among diploid species of* Solanum. *(p. 180).*

Crosses were made among 30 species representing sections *Tuberosa*, *Demissa*, *Cardiophylla*, *Bulbocastana*, *Commersoniana*, *Pinnatisecta*, *Polyadenia* and *Megistacroloba*. Evidence of some cross incompatibility between members of the *Tuberosa* and *Commersoniana* was obtained. *S. polyadenium* was very effectively isolated from other species, only crosses with *S. macolae*, *S. rybinii* and *S. gibberulosum* producing seed. *S. raphanifolium*, belonging to the *Megistacroloba*, could be readily crossed with the *Tuberosa* and *Commersoniana*.

665 *Mills, W. R.* (*pp. 181–83*).
As indicated by their high degree of field resistance to late blight in the Toluca Valley, Mexico, hybrids of (*S. demissum* x diploid spp.) x *S. stoloniferum* from Wisconsin appear promising as a new source of resistance.

*Texas*

666 *Leeper, P. W. Irish potato variety and breeding line evaluation tests.* (*pp. 192–96*).
Data are given on the yield, skin colour and scab resistance of varieties and advanced lines.

667 *Meyer, H. M.* (*p. 197*).
Four red selections resistant to scab and late blight were tested in the lower Rio Grande valley. B2368–4 (Pontiac x B400–1) was probably the most promising, with superiority in yield over Pontiac, shallow eyes, attractive colour and vigorous haulms.

*Washington*

668 *Locke, S. B.* (*pp. 204–05*).
Seedlings selected for further testing are listed. Russet Burbank and seedlings involving this variety in their pedigrees were the chief parents used in recent crosses.

*West Virginia*

669 *Gallegly, M. E.* (*pp. 206–10*).
As indicated by their reaction to race 1,2,3,4, hybrids of (*S. demissum* '160221–3', '161179–1' and '161366–5' x diploid spp.) x *S. tuberosum* appeared to contain a new dominant gene ($R_x$) for resistance to late blight, derived from *S. demissum*. Within *S. tuberosum*, the combination of all four of the genes $R_1$–$R_4$ with a high degree of polygenic resistance in a commercial type is being sought. Selections carrying one to four of the genes were rated in the greenhouse for polygenic resistance. The ratings showed no correlation with field performance in Mexico. Some of the selections however displayed a considerable degree of polygenic resistance in that country. Mating groups have been found in the late-blight fungus; only one group has so far been identified in the USA but both groups occur in Mexico [cf. XXVII, 4161].

670 *Gallegly, M. E.* et al. *Late blight investigations.* (*pp. 211–13*).
A short report is presented by the Late Blight Investigations Committee of the Potato Association of America [cf. XXVII, 4160].

*Wisconsin*

671 *Cooper, D. C.* et al. (*p. 214*).
Investigations on interspecific crossability and the cytogenetics of tuber-bearing *Solanum* spp. were expanded. The material studied included hybrids between colchicine-induced tetraploids of diploid species and *S. tuberosum*, hybrids from crosses among *S. fendleri*, *S. papita*, *S. stoloniferum* and *S. polytrichon*, and crosses of *S. demissum* with diploid species and crosses of these combinations with *S. tuberosum* and *S. stoloniferum* [cf. XXVI, 2507]. Attempts to hybridize colchicine-induced tetraploids of *S. pinnatisectum*, a species highly resistant to late blight and southern bacterial wilt, with *S. tuberosum* were unsuccessful. Crossing of *S. pinnatisectum* with five South-American diploid species, known to hybridize with *S. tuberosum*, resulted in seed balls but most seeds were abortive.

672 *Larson, R. H. & Akeley, R. V. Physiological internal tuber necrosis.* (*p. 215*).
In a test of six commercial varieties, only Boone was free from the above necrosis.

673 *Rieman, G. H. & Young, D. A. Breeding problems associated with resistance to scab.* (*pp. 216–17*).
A high degree of resistance to scab has continued to be associated with a light-brown, flaked type of russet skin and with nonparasitic internal tuber necrosis in selections involving Jubel or Hindenburg in their parentage.

674 *Stevenson, F. J. & Jones, E. D. Red Dot Foods, Inc.* (*pp. 218–21*).
The chief aim of recently initiated breeding is the production of varieties with better quality for crisp manufacture than is at present found in commercial potatoes.

*Wyoming*

675 *Riedl, W. A. & Vaughn, J. R.* (*pp. 222–25*).
High-yielding, red-skinned selections and varieties were crossed with seedlings resistant to scab and ring rot, as well as with seedlings having high specific gravity. Selections promising in yield and dry-matter content were obtained from families possessing Red McClure as ♀ parent.

676 BABB, M. F. & DEARBORN, C. H.
**Performance of 55 potato varieties in Alaska's Matanuska valley 1948-1951.**
Bull. Alaska agric. Exp. Sta. 1957 : No. 23 : Pp. 15.

Data are provided on the yield, specific gravity, solids content and various horticultural characters of the varieties tested. Direct comparisons are made with Arctic Seedling.

677 GEIDEL, H.
Lochkarten und Kartoffelprüfungen. (**Punched cards and potato tests**).
Kartoffelbau 1957 : **8** : 126–27.

Examples are given of the use of punched cards in making varietal comparisons where a large number of different factors, such as variety, year, altitude and crop rotation, are taken into consideration.

678 BAHAREVA, S. N.
(**Improving the crossability of wild potato species**).
Kartofel' (Potato), Moskva 1957 : No. 2 : 44–45. [Russian].

Work on improvement of crossability of such species as *Solanum laplaticum*, *S. gibberulosum*, *S. schickii*, *S. dolichostigma*, *S. knappei*, *S. horovitzii* and *S. demissum* with wart-resistant domestic varieties as a preliminary to breeding varieties resistant to Colorado beetle at the Institute of Plant Industry is reported. The method consisted of vegetative rapprochement and fertilization with mixed pollen comprising the pollen of highly fertile cultivated varieties and wild species. The best results were obtained with mixtures which included the pollen of Kameraz, Oktjabrenok [Octobrist] and *S. demissum*. In some cases, pollination was carried out several times. This resulted in the development of ten times as many berries and an even greater increase in the number of seeds per berry. Among the results obtained are hybrids of domestic varieties with *S. commersonii*, *S. sucrense* and *S. subtilius*, a hybrid of *S. polyadenium* x *S. jamesii* and some unspecified hybrids resistant to Colorado beetle.

679 WANGENHEIM, K.-H. v.
Das Pachytän und der weitere Ablauf der Meiose in diploiden *Solanum*-Arten und -Bastarden. (**Pachytene and the further course of meiosis in diploid *Solanum* species and hybrids**).
Chromosoma 1957 : **8** : 671–90.

Meiosis of the pollen mother cells was studied in *S. vernei*, *S. simplicifolium* and *S. polyadenium* and in *S. vernei* x *S. famatinae*, *S. vernei* x *S. toralapanum*, *S. verrucosum* x *S. vernei*, *S. vernei* x *S. simplicifolium* and the reciprocal, *S. simplicifolium* x *S. goniocalyx*, and *S. goniocalyx* x *S. chacoense*. In crosses between different taxonomic series no irregularities of chromosome pairing or separation were observed, but where *S. simplicifolium* was used as mother plant, abnormalities of division leading to the formation of empty pollen grains or unreduced dyads were seen and could be attributed to a cytoplasmic effect upon the spindle mechanism rather than to lack of homology between chromosomes.

680 ROTHACKER, D.
Untersuchungen über den Einfluss von Kreuzungszeitpunkt und Pfropfung auf den Bastard-Samenertrag bei Kreuzungen zwischen knollentragenden *Solanum*-Arten. (**Investigations on the influence of grafting and time of crossing on the yield of hybrid seed in crosses between tuberiferous *Solanum* species**).
Züchter 1957 : **27** : 232–38.

In crosses of (1) *S. acaule*, various $F_1$ interspecific hybrids, *S. parodii* and *S. andigenum* with the pollen parent *S. tuberosum*, (2) *S. parodii* ♀ with ♂ clones with $2n = 24$ and (3) synthetic clones having $2n = \pm 72$ with the pollen parent *S. demissum*, grafting the female parent upon tomato or, occasionally, on potato stocks had no favourable effect upon cross fertility, although in crosses of type (3) flowering of the mother plant was improved by grafting. No evidence of vegetative hybridization was obtained. Throughout the experimental period, from 1952 to 1955, the greatest number of successful crosses each year was effected from the middle of August onwards.

681 GOWEN, F. A.
**Selfing in the potato as a means of securing improved parental clones.**
Diss. Abstr. 1956 : **16** : Publ. No. 19,200 : p. 2286.

Tests of selfed progeny gave a more accurate evaluation of parental genotypes than progeny derived in the usual way from crosses of phenotypically superior heterozygous parents. The objectives of selection were as a rule more easily attained by means of selfed progeny. In cycles of inbreeding, the characters of parent and progeny were more closely associated than in material derived from unrelated heterozygous parents. Concurrently with testing of the genotype, natural selection facilitated isolation of the better seedlings in selfed progenies, about 60% of the seedlings being naturally eliminated during the first year. Upon further selfing, progenies of selected clones often showed wider segregation for most characters. Selections with combining ability superior or inferior to that of their parents were obtained, significant differences in specific combining ability frequently being found between closely related inbreds. Greater disparities in combining ability occurred in the selfed material than in the heterozygous.

682 LINNIK, G. N.
**(Causes of degeneration of the potato).**
Kartofel' (Potato), Moskva 1957 : No. 2 : 16–21. [Russian].

Experiments at Har'kov showed that the yield of a variety was higher when the seed tubers from which it was grown were dug before they were wholly ripe. The selection of physiologically juvenile clones is discussed.

683 **New varieties of Dutch potatoes.**
Potato News Netherlands **6** : No. 3/4 : 11–12.

Three new wart-immune varieties included in the 32nd varietal list [XXVII, p. 761] are described in detail. Avenir [Future] is a medium-early potato with long oval tubers, white flesh and good yield. The medium-late variety Burmania is immune from streak virus and has round, red-skinned, yellow-fleshed tubers of good keeping quality. Ambassadeur [Ambassador], an industrial variety, ripens late, yields well, has yellow-fleshed tubers high in starch content and is immune from viruses A and X and streak virus.

684 **Tawa potato is promising.**
What's New Crops Soils 1957 : **9** : No. 8 : 27–28.

An early, high quality, smooth white potato named Tawa has been jointly released by the Iowa and Michigan Agricultural Experiment Stations and the USDA. It combines resistance to scab, late blight, mild mosaic and viruses A and X and is of good quality for crisps both at harvest and after storage.

685 ROTHACKER, D. & FIELDER, H.
Die Erzeugung polyploider Kartoffelpflanzen nach der Pfropfcolchicinierungsmethode. **(The production of polyploid potato plants by the method of colchicining cuttings).**
Züchter 1957 : **27** : 183–86.

By the grafting method referred to earlier [XXV, 2708], keeping the air humidity at 20% and the temperature at 20° C., with colchicine solutions of 0·05 and 0·1% for 72–96 hr., and using tomatoes as rootstocks, successful polyploids of *Solanum parodii* were produced.

686 STEINECK, O. & CZEIKA, G.
Anatomische und cytologische Untersuchungen über tageslängenbedingte Wachstumsänderungen im Sprossmark der Kartoffel. **(Anatomical and cytological investigations on growth changes in the stem pith of the potato induced by length of day).**
Züchter 1957 : **27** : 272–78.

Examinations were made on a number of varieties differing in photoperiodic reaction. The zone of cell division and elongation was shorter in plants grown under short photoperiods, the reduction being more pronounced in varieties such as Falke [Falcon] and Ultimus than in Flava and Mittelfrühe [Midearly]. In certain varieties such as Mittelfrühe and Falke the zone in which tetraploid cells arise by endomitosis occurred closer to the growing point in plants grown under short photoperiods, whereas no such difference was observed in other varieties such as Flava.

In varieties with high photoperiodic requirements the zone of cell division and elongation and the zone in which endomitosis had not yet started were both longer than in varieties with lower photoperiodic requirements and it is suggested that examination of these zones may provide a simple method of determining the critical period in potato seedlings [cf. XXVII, 4138] and so facilitate the breeding of forms with suitable photoperiodic reactions.

687 STRODOV, V. F.
**(The best varieties for digging twice a year).**
Kartofel' (Potato), Moskva 1957 : No. **3** : p. 56. [Russian].

Šuntukskij was the most productive among the early varieties sown and dug twice in a year at Odessa. The tubers of the spring-sown crop were lifted on 5 July and sown on the same day for the second crop, lifted on 20 October.

688 OREL, L. I.
**(Influence of period of storage of pollen of some species of the Solanaceae and pea on its germination).**
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1957 : **31** : No. 2 : 145–49. [Russian].

Figures are given showing the percentage germination of pollen of a number of Solanaceous species and of the pea variety Lord, in the fresh state and after storage at room temperature (20–24° C.) for varying periods. Pollen of the tomato Bison and the domestic potato had a germinating capacity of only about 35% when fresh and this fell to 5·8% and 2·1% respectively after three days; germinating percentage in pollen of wild species such as *Solanum demissum*, *S. dulcamara* and *Hyoscyamus niger* was higher and was retained for up to nine days whereas *Nicandra physaloides* and pea had a high germination percentage in the fresh pollen but lost it after 3–6 days.

The carotenoids in the pollen gradually disappeared during the period of storing.

689 Nečas, J.
Dědičnost typu variability velikosti a tvaru škrobových zrn u bramborů—I. část. (**The inheritance of the type of variability in size and shape of potato starch grains. Part I**).
Sborn. čsl. Acad. zeměd. Věd : Řada rostlinná Výroba 1957 : **30** : 393–404.

A higher correlation was detected between size of tuber and size of starch grains than between starch content and size of starch grains.

690 Nečas, J.
Dědičnost typu variability velikosti a tvaru škrobových zrn u bramborů. II. část. (**The inheritance of the type of variability in size and shape of potato starch grains. Part II**).
Sborn. čsl. Acad. zeměd. Věd : Řada rostlinná Výroba 1957 : **30** : 405–24.

The type of variability in size, but not in shape, of starch grains was a genotypical characteristic, even though to some extent it was modified by environment. Sexual progenies from intervarietal crosses showed a wide range in respect of variation in starch-grain size.

691 Mathlein, R.
Några olika potatissorters förhållande till ringröta. (**The reactions of different potato varieties to ring rot**).
Växtskyddsnotiser 1957 : **21** : 28–33.

In inoculation tests of 14 varieties, Alpha, Elsa, Anna and President showed good resistance. In some varieties there was a marked lack of correspondence between leaf and tuber symptoms.

692 Johnson, G. & Schaal, L. A.
**Chlorogenic acid and other orthodihydricphenols in scab-resistant russet Burbank and scab-susceptible Triumph potato tubers of different maturities.**
Phytopathology 1957 : **47** : 253–55.

The periderm of tubers of Russet Burbank, resistant to *Streptomyces scabies*, was found to contain a higher concentration of chlorogenic acid and total orthodihydric phenols than that of the susceptible variety Triumph, the difference being most marked during the stage of rapid tuber growth [cf. XXII, Abst. 2822 and XXIV, Abst. 2163].

693 Tomiyama, K.
(**Cytological studies on resistance to potato blight. III. Measurement of the time taken for browning of the cells following infection by the blight fungus**).
Nihon Shokubutsubyorigaku Kai Ho/ Ann. phytopath. Soc. Japan 1956 : **20** : 165–69. [Japanese].

Studies on the reaction of epidermal cells from the midrib of the resistant variety 41089–8 and the susceptible variety Hokkai 9 are reported. In the case of the resistant variety, the sequence of events, appearance of granules in Brownian motion → discoloration of the cell → cessation of Brownian movement, took place much more rapidly than in the susceptible variety. [Cf. XXVII, 3182].

694 Sytina, Z. A. & Čenykaeva, E. A.
(**A promising early variety**).
Kartofel' (Potato), Moskva 1957 : No. **2** : p. 55. [Russian].

In the trials of early potato varieties in the province of Moscow, Sedov invariably outyielded all others. Together with Severjanin [Northerner], it produced larger tubers than other varieties and showed a higher degree of resistance to mosaic and *Phytophthora* [cf. 631].

695 Wallin, J. R.
**Response of potatoes to monozoospore lines of *Phytophthora infestans*.**
Plant Dis. Reptr. 1957 : **41** : 612–15.

A number of potato varieties were found to vary in their response to lines from two cultures of race 1 of *Ph. infestans* (Cultures 1 and 58). Culture 58 was most virulant and only 3XX–1, with the genotype $R_1R_2R_4$, was resistant to it. Lines from culture 1 did not sporulate on Kennebec and Cherokee and B2376–1 was highly resistant to this culture.

696 Doling, D. A.
**Physiologic races of *Phytophthora infestans* (Mont.) de Bary in Northern Ireland.**
Ann. appl. Biol. 1957 : **45** : 299–303.

Using the detached-leaf technique and Black's series of differentials, the following races were found in N. Ireland: 0; 1; 2; 4; 1,2; 1,4; and 1,2,4. Only races 0 and 4 were identified in isolates derived from the commercial potato crop. Modifications of the detached-leaf technique resulted in minimizing the formation of atypical infections showing sparse sporulation.

697 Takase, N.
**(Studies on the resistance of potatoes to late blight. III. On the reaction of interspecific potato hybrids to artificial inoculation with late-blight strains).**
Ikushugaku Zasshi/Jap. J. Breeding 1957 : **6** : 233–36. [Japanese].

Fifteen hybrids with *Solanum demissum* in their ancestry were inoculated with the Japanese blight strains $H_1$, $H_2$ and $H_3$. Leaf and tuber reactions were highly correlated. The hybrids could be classified into three groups on the basis of their reaction to the three strains: (1) resistant to $H_1$ and $H_2$, susceptible to $H_3$; (2) resistant to $H_1$ and $H_3$, susceptible to $H_2$; and (3) resistant to $H_1$, $H_2$ and $H_3$. [Cf. XXVII, 674].

698 Valle, E.
**On anti-fungal factors in potato leaves.**
Acta chem. scand. 1957 : **11** : 395–97.

Extracts with an inhibitory effect upon the growth *in vitro* of *Phytophthora infestans* were obtained from leaves of the resistant variety Aquila and were found to contain the antifungal factors chlorogenic and caffeic acids as well as a small quantity of an unidentified antifungal substance. The amount of free chlorogenic acid in potato leaves is often sufficient to inhibit fungal growth but the amount of caffeic acid is insignificant. Antifungal activity was also observed in leaf extracts from the highly susceptible variety Sieglinde but was appreciably lower than in those from Aquila.

699 Karceva, K. V. & Sivak, V. P.
**(Raising élites in the Ukrainian SSR).**
Kartofel' (Potato), Moskva 1957 : No. **2** : 8–12. [Russian].

Mention is made of new wart-resistant potato varieties bred in the Ukraine, notably Polessk Rannij [Early Polessk] and Ostrovskij, both from Polessk. The former variety is productive, early and good in flavour; the latter is a high-yielding midseason general-purpose type.

700 Hey, A.
Zur Rassenanalyse des Kartoffelkrebses (*Synchytrium endobioticum* (Schilb.) Perc.). **[On the analysis of races of potato wart (*S. endobioticum* (Schilb.) Perc.)].**
Z. PflKrankh. 1957 : **64** : 452–57.

On the basis of their aggressivity on potato differentials, samples of *S. endobioticum* from Dahlem, Giessübel, Pappenheim, Koppatz, Rudolfstadt and Eulendorf, East Germany, appear to belong to six physiologically distinct races, designated $D_1$, $G_1$, $P_1$, $K_1$, $R_1$ and $E_1$ respectively. Race $D_1$ is that which has been chiefly used as a test organism in breeding for resistance in recent years. The three potato varieties Mira, Argo and Hilla have proved resistant to all races.

701 Rothacker, D.
Arbeiten zur Züchtung krebsresistenter Kartoffeln. **(Work on breeding wart-resistant potatoes).**
Züchter 1957 : **27** : 181–83.

Four distinct races of potato wart have been identified in the German Democratic Republic and others exist in Federal Germany. Tests of 5555 genetically different potato types were undertaken on fields at Giessübel infected with biotype G and others were tested against biotype D; the material tested comprised members of 48 species. Resistance to both biotypes was found in members of *Solanum parodii*, *S. acaule*, *S. demissum*, *S. simplicifolium* and *S. vernei*.

702 Kozlova, M. M.
**(The influence of vegetative hybridization on the wart resistance of seedlings).**
Kartofel' (Potato), Moskva 1957 : No. **1** : 36–37.

Grafting a wart-resistant scion on to a susceptible variety increased the wart resistance in the year of grafting but the resistance was not retained in succeeding tuber generations.

703 Ferris, J. M.
**A study of factors influencing the susceptibility of Solanum species to the golden nematode, *Heterodera rostochiensis* Wollenweber.**
Diss. Abstr. 1956 : **16** : Publ. No. 19,155 : 2290–91.

Potency of the root diffusate was not necessarily correlated with susceptibility of a species to *H. rostochiensis*, as indicated by tests of *S. tuberosum*, *S. dulcamara*, *S. citrullifolium*, *S. integrifolium*, *S. nigrum*, *S. rostratum* and *S. xantii*. Number of larvae penetrating the host species and larval development depended upon the temperature. Fewer larvae penetrated *S. dulcamara* than *S. tuberosum*. Still fewer entered *S. integrifolium* and *S. citrullifolium*. Most larvae in *S. tuberosum* and *S. dulcamara* reached maturity; a smaller proportion completed the life cycle in *S. integrifolium*. Nematode development at a given temperature was most rapid with *S. tuberosum* as host. Interspecific histological differences in reaction to infection were noted.

704 Kameraz, A. Ja.
**(Breeding potatoes for resistance to Colorado beetle).**
Kartofel' (Potato), Moskva 1957 : No. 1 : 31–36.

Tabular data are presented indicating the species that have shown resistance to the Colorado beetle and their chromosome numbers, place of origin and degree of compatibility with the domestic potato. Crosses are generally more successful when the primitive species is used as seed parent and the wild 24-chromosome species often give better results when their chromosome number has been doubled. *Solanum macolae* is difficult to cross with *S. tuberosum* though one cross has been achieved with Severnaja Roza [Northern Rose]; crosses of *S. macolae* with *S. simplicifolium* have been made, as have also crosses of *S. polyadenium* x *S. jamesii*. A number of derivatives of *S. demissum* are in cultivation in the USSR but their reaction to Colorado beetle is not fully known. In crosses with species of the series *Glabrescentia* occasional seedlings with good tuber yield occur in the $F_1$ or later generations and back crosses; in the second and third back crosses from *S. subtilius*, *S. emmeae* and *S. gibberulosum*, seedlings bearing up to 2500 g. of tubers have occurred; some of them have starch contents of up to 30%; by a suitable choice of parents it is possible to produce hybrids of this type that are resistant to the common races of blight and many of them are also resistant to *Macrosporium* scab and wart. Some of these seedlings in 1956 showed an attack of 10–30% by the beetle under conditions where Ackersegen showed 100%; the best seedlings were back-cross hybrids of *S. gibberulosum*, *S. saltense*, *S. parodii*, *S. schickii*, *S. emmeae*, *S. horovitzii* and *S. subtilius* and in yield and quality they were equal to the standard commercial varieties.

705 Schreiber, K.
*Solanum*-Alkaloide IV. Über die Glycoalkaloide einiger Wild-kartoffeln der Ser. *Commersoniana* **(*Solanum* alkaloids IV. On the glycoalkaloids of some wild potatoes of the series *Commersoniana*).**
Pharmazie 1955 : **10** : 379–86.

A glycoalkaloid found in *S. chacoense*, *S. commersonii* and *S. schickii* proved to be identical with solanin from *S. tuberosum* and therefore cannot be responsible for the Colorado beetle resistance of these species.

706 Johansen, R. H.
**Field resistance of the potato selection ND 457-1 to virus Y.**
Amer. potato J. 1957 : **34** : 169–76.

In comparison with the susceptible variety Red Pontiac, ND 457–1 was found to possess a high degree of field resistance to virus Y.

707 Köhler, E.
Untersuchungen zur Frage der Immunität des Kartoffel-"U.S.D.A. Seedling 41956" gegen das X-virus. **(Investigations on the question of the immunity of the potato USDA Seedling 41956 to virus X).**
Züchter 1957 : **27** : 177–79.

Leaflets of seedling 41956 when rubbed with strain H19 of virus X and kept for 9 days at 2° C. were capable of infecting *Gomphrena globosa* with their sap but when kept for 4 days at 22° C. the infectivity was lost. Strain M23, when rubbed into leaves kept at 2° C., retained its infectivity for some 20 days but in a warm greenhouse lost it after 72 hours. There were no indications that the sap of 41956 had any inhibiting effect on the capacity of the virus to infect *G. globosa* and the indications are that this seedling inactivates the virus in its leaves when growing at normal temperatures.

708 Möller, K.-H.
Die Prüfung von Populationen in Abbaulagen, ein Hilfsmittel zur Züchtung abbauwiderstandsfähiger Kartoffeln. **(Testing populations in degeneration areas, an auxiliary method in breeding potatoes resistant to degeneration).**
Züchter 1957 : **27** : 257–61.

In addition to selecting the best seedlings from a cross in the usual way, the author sends one tuber of each of 300 plants from each cross to be grown for two successive years in an area excessively subject to leaf-roll infection. Some tubers of the fourth and fifth tuber reproductions of the selections are also tested in this way. There was a good agreement between the two sets of results. The highest percentage of healthy seedlings came from crosses using the resistant strains Gülzow 633 and Kleinwanzleben 448/45; next best were the progenies of Aquila, Robusta and the strain Malchow 43.5/399. All other progenies, even those from the resistant varieties Bona, Flava and Johanna, were only medium or poor in resistance. Crosses between two resistant parents gave the highest proportion of healthy plants, the best being 40% in the cross Fortuna x Gülzow 633; this cross combines resistance factors of *Solanum andigenum*, from Fortuna, with those from Aquila, one of the parents of Gülzow 633.

709 Massey, P. H. (Jun.), Eheart, J. F., Young, R. W. & Camper, H. M.
**The effects of variety on the yield and vitamin content of sweet potatoes.**
Proc. Amer. Soc. hort. Sci. 1957 : **69** : 431–35.

Nearly all the new varieties and seedlings tested were superior in yield and contents of ascorbic acid and carotene to Unit I Porto Rico. B–5941, giving the highest yield of first-grade roots, had twice as much carotene (21·7 mg. per 100 g.) as this standard. Ascorbic-acid content was highest in B–5999 (105·2 mg. per 100 g.), which also had three times as much carotene as Unit I Porto Rico.

710 Scott, L. E. & Kattan, A. A.
**Varietal differences in the catechol oxidase content of the sweet potato root.**
Proc. Amer. Soc. hort. Sci. 1957 : **69** : 436–41.

Wide differences were found among varieties in the degree of activity of the catechol oxidase system which is responsible for discoloration during preparation for processing. Degree of oxidase activity was negatively correlated (— 0·69) with intensity of flesh colour. The oxidase-activity test is recommended as an aid in the evaluation of processing qualities in breeding.

## FIBRES

711 Pudovkina, Z.
**(The development of cotton hybrids under different light conditions).**
Hlopkovodstvo (Cott.-raising) 1957 : No. 6 : 33–37. [Russian].

After $F_1$ plants of S460 x S3404, S3316 x S460 and 138F x S460 had been grown under short days, the $F_2$, $F_3$ and $F_4$ matured early, even when grown under conditions of natural daylight at Taškent. The $F_2$, $F_3$ and $F_4$ from $F_1$ hybrids grown under long days matured late. The progeny from the $F_1$ subjected to short days showed improvements in yield and ginning percentage but a decrease of 0·5 to 0·7 g. in boll weight.

712 Butkova, V.
**(The breeding and seed growing of cotton under conditions of new agricultural methods).**
Hlopkovodstvo (Cott.-raising) 1957 : No. 8 : 29–34. [Russian].

Varietal differences in yield and other economic characteristics between 108F, 148F, 114 and S1211 which were cultivated in 45, 50 or 60 cm. squares were noted.

713 Ansari, M. A. A.
**Extra short staple cotton of Pakistan.**
Pakist. Cott. 1956 : **1** : No. 4 : 1–5.

A survey is given of the production of *G. arboreum* cottons with extra short staple in Pakistan, recommended varieties and the aims of recently-initiated schemes of breeding to develop varieties improved in yield and technological properties.

714 Aleksandrov, A.
**(Cotton growing at the USSR Agricultural Exhibition in the year 1957).**
Hlopkovodstvo (Cott.-raising) 1957 : No. 6 : 5–8. [Russian].

Mention is made of new high-yielding varieties from Central Asia, in particular 147F from Fergana and 5010V from Kurgan-Tjube. The former matures early and has a large boll. The other is a fine-fibred variety which outyields 504–V, the standard in Tadžikistan, by 10–20% and produces high quality fibre 38–40 mm. long.

715 **(New cotton varieties).**
Hlopkovodstvo (Cott.-raising) 1957 : No. 6 : p. 63. [Russian].

Some varieties obtained by interspecific hybridization at the Central Asiatic Research Station of the Institute of Plant Industry produce bolls weighing 11–12 g.; others ripen 20–25 days earlier than 1306 and exceed this in yield and length of fibre. The variety 844 has longer fibre than the standard 108F and outyields it by 25%, most of the yield increase being accounted for by pre-frost crop.

716 Méndez R., E. D.
Creación de variedades de algodón. Campaña 1955–56. **(Production of new varieties of cotton. Season 1955-56).**
Inf. mens. Estac. exp. agríc. La Molina 1957 : **31** : No. 358 : 1–5.

A collection of the main species of *Gossypium* has been maintained and hybrid populations from intervarietal and interspecific crosses have been selected for combinations of earliness and yield. Several selections from the cross Tangüis x Pima equalled the best Tangüis selections in lint yield and relative earliness and two exceeded them.

717 **Genetics and cytology of cotton 1948-55.**
Sth. Coop. Ser. Bull., undated : No. 47 : Pp. 67.

Most of the work reviewed in this bulletin has already been summarized from other sources. Reference is made to cytological and genetical studies of a number of *Gossypium* species and interspecific hybrids and to the bearing of these studies on breeding for improved yield and quality.

718 Rhyne, C. L.
**Duplicated linkage groups in cotton.**
J. Hered. 1957 : **48** : 59–62.

Loci $Yg_1$ and $Dw$ have been found to be linked with $R_1$ in genome D of *Gossypium hirsutum* [cf. *PBA* XXV, 3224]. On the basis of suggestions made by the author and other investigators, $R_1$, $Cl_1$, $Yg_1$ and $Dw$, now known to constitute a linkage group in genome D, are regarded as duplicates of the linked loci $R_2$, $Cl_2$, $Yg_2$ and $Lc_1$ respectively in genome A. Problems arising in three-point linkage tests involving either of these groups are discussed.

719 Kesava Iyengar, N., Ramachandran, K. & Balachandran, M.
**A note on the occurrence of a natural hybrid between Asiatic and American cotton in Madras State.**
Indian Cott. Gr. Rev. 1957 : **11** : 38–39.

A natural hybrid between *Gossypium arboreum* and *G. hirsutum* is described. The plant has exceptional vigour. It is a triploid with 39 chromosomes and is sterile.

720 **New cotton varieties have larger bolls.**
What's New Crops Soils 1957 : **9** : No. 8 : p. 26.

The Texas Agricultural Experiment Station reports that the first cotton varieties developed by combining Asiatic, Arizona Wild and Upland stocks will shortly be released. One is characterized by larger boll size although it does not give much higher yields than Deltapine types. Other strains from the same cross include SPHI–4, giving a 15% higher spinning performance than Deltapine but a 10% lower yield, and Able, which is higher in fibre strength than SPHI–4.

721 Lewis, C. F.
**Genetic recombinations in a hybrid involving three species of *Gossypium*.**
Agron. J. 1957 : **49** : 455–60.

An allotetraploid hybrid between *G. arboreum* and *G. thurberi* was crossed with tetraploid *G. hirsutum* at College Station, Texas, but of the $F_2$ progeny obtained about two thirds died in the seedling stage and 43% of the surviving plants were sterile. Both $F_2$ and $F_3$ progenies were extremely variable in respect of plant habit, seed size and quality and all lint characters, transgressive segregation being observed for some characters. Highly significant correlations were found for leaf index C, seed index and lint strength, length, fineness and shape between $F_2$ plants and the mean values of their $F_3$ progenies. In both $F_2$ and $F_3$ plants lint fineness and lint shape were highly correlated.

722 Hsi, Y.
**A brief introduction on the cotton situation in China.**
Indian Cott. Gr. Rev. 1957 : **11** : 11–15.

This review describes some improved varieties in current use and some promising new varieties. Tieho and Kiangpu 8 are high yielding, Long staple 2 has early maturity, good quality and high yield, and Long staple 3 is vigorous and matures fairly early.

723 **Texas releases Austin cotton.**
What's New Crops Soils 1957 : **9** : No. 8 : p. 28.

The Texas Agricultural Experiment Station, together with the USDA, has developed an open-boll type of cotton from Stoneville 20 x Empire back crossed to Empire. It is highly resistant to race 1 of bacterial blight and tolerant to race 2 and the wilt-nematode complex. Under disease conditions it gives yields 5–100% better than other open-boll varieties. It gives satisfactory yields under drought conditions but performs best under normal rainfall or irrigation. Its staple length is 30/32 to 33/32, its fibre satisfactory for yarn and its seed of good quality for cotton-seed products.

724 Sikka, S. M., Swaminathan, M. S. & Jagatheesan, D.
**A note on some X-ray induced variations in Upland cotton.**
Indian J. Genet. 1956 : **16** : 144–45.

Seeds of the variety 320F have been treated with X rays. Structural changes in the flowers and in the chromosomes occurred and self fertilization was not possible. Bolls were set when crosses using normal pollen were made.

725 GAVRILOV, G.
**(New early-maturing large-bolled varieties for the northern cotton-growing regions).**
Hlopkovodstvo (Cott.-raising) 1957 : No. 7 : 42–45.

By pollinating the early-maturing cotton varieties of Kara-Kalpakia with large-bolled forms from distant geographical regions and selecting the progeny for vigour of growth, early dehiscence of the bolls and short internodes, three improved varieties have been produced and are described. All of them exceed commercial varieties such as KK–1086 and 108–F in yield, length and quality of lint, earliness and size of boll.

726 GADKARI, P. D. & SAINI, A. D.
**Observations on the stomata frequency in Indian cottons.**
Indian Cott. Gr. Rev. 1957 : **11** : 16–37.

The stomatal frequency per unit area of the upper and lower leaf surface has been determined for 20 varieties.

727 IYENGAR, R. L. N.
**Technological reports on trade varieties of Indian cottons, 1956.**
Technol. Bull. Indian Cott. Comm. : Ser. A : 1957 : No. 91 : Pp. 92.

The results of fibre, yarn and spinning tests on samples of 35 commercial varieties grown in the season 1955–56 are presented [cf. XXVII, 708].

728 SETHI, B. L. & DHARMARAJULU, K.
**Possibilities of breeding extra long staple cottons in India.**
Indian Cott. Gr. Rev. 1957 : **11** : 1–5.

Fibre characteristics are given for a number of new long-staple cottons. The Indo-American strains 170–Co.2 and 134 Co.2–M have an inadequate yarn strength. MCU1 and MCU2 are more satisfactory in this respect. Andrew is promising and has a high yield. The LL series have an extra long staple and good lea strength. LL56 is the best. The Egyptian Giza 12 and Giza 7 are likely to prove suitable for Mysore conditions.

729 NANJUNDAYYA, C.
**Technological research on cotton in India. A résumé of the work carried out at the technological laboratory during the period 1924-1956.**
Technol. Lab. Indian Cott. Comm. 1956 : Pp. 205.

The publication provides a comprehensive survey of (1) the history and aims of the Technological Laboratory of the Indian Central Cotton Committee, (2) research on ginning, fibre and yarn properties and on spinning technology and (3) tests carried out for breeders and for the cotton trade and industry.

730 ESTRADA, J. A., CHIRIBOGA, J. & VEGA, G.
Determinación de gossypol en semilla de diferentes variedades de algodón en las pastas derivadas de estas y en subproductos usados en la alimentación animal. **(Determination of gossypol in the seed of different cotton varieties and in the meals derived from these and in by-products used for animal feeding).**
Agronomía, Lima 1957 : **24** : No. 89 : 81–86.

Data are provided on the gossypol content of the seeds of samples of cotton varieties and strains grown in various regions of Peru.

731 AFZAL, M. & KAMAL, M.
**Survey of cottons of Goa.**
Pakist. Cott. 1957 : **1** : No. 5–6 : 1–12.

The survey organized by the Pakistan Central Cotton Committee is described and the results of a study of the technological properties of the 45 samples obtained are reported. Most of the collections belonged to a type of perennial Bourbon (*Gossypium hirsutum*) with medium staple. The three samples with the longest staple had 1·21″, 1·22″ and 1·29″ upper quantile length respectively, the corresponding figures for fibre weight being 5·42, 5·16 and 5·60 g./in. If such a combination of long staple and coarseness can be bred into suitable varieties, production of a very desirable class of cotton will be possible in Pakistan. Many samples had a strength of the order of 80,000 lbs. per in.$^2$ or over but maturity coefficients tended to be unsatisfactory. Trials of the collections have been initiated at Lyallpur and Tandojam to discover the most promising material for breeding.

732 DAHNOVIČ, T.
**(The effect of soil salinity on changes of some characteristics in cotton).**
Hlopkovodstvo (Cott.-raising) 1957 : No. 6 : 29–33. [Russian].

Changes in growth, anatomical, morphological and physiological properties and chemical composition of such varieties as VIR 134 [Institute of Plant Industry 134], 1306 and 108F consequent upon growing on saline soils in Turkmenia are described. The changes are regarded as adaptive and probably of value in breeding varieties tolerant of salinity.

733 Boza Barducci, T., del Carpio Burga, R., Herrera Arangüena, J. & Urbina Cevallos, J.
Recomendaciones para el cultivo del algodón en el valle de Cañete. Campaña 1957–58. **(Recommendations for cotton cultivation in the Cañete valley. Season 1957-58).**
Circ. Estac. exp. agríc., Cañete 1957 : No. 13 : Pp. 11. (Mimeographed).

The recommendations include indications of the most suitable varieties to plant in different areas. Tangüis selection Cñ 281–51 has given good yields of lint of high quality and is free from the main pests and diseases. For poor soils infested with nematodes and *Thielaviopsis basicola* lines Cñ 629–51, Cñ 601–51 and Cñ 70–51 are recommended; for moist soils containing saltpetre, Cñ 281–51, Cñ 550–51 and LM 7–35; and for soils infected with *Verticillium* wilt, LMW 395–42, LMW 12–40, Cñ 276–51 and Cñ 281–51.

734 Manolov, J., Konišev, P. & Božinov, M.
**(The principal questions for us in cotton breeding).**
Selskoptopan. Misăl 1956 : **12** : 734–39.

This report on breeding work with cotton in Bulgaria mentions the following new varieties from Sadovo and Čirpan. Variety 3279A (18885 x 38) shows resistance to *Verticillium* wilt, outyields the standard 2362 and ripens 2–3 days earlier. Sadovo 411 (Malkov x 36–$M_2$) and Sadovo 432 (2362 x S–15–200) yield 18% more fibre than 2362, the increase being partly accounted for by 9–12% improvement in raw cotton yield. Variety 3996–B from Čirpan is a hybrid of 2367 with the Argentine variety Las Breñas. It has a growth period not exceeding 130 days and produces fibre 32–33 mm. long.

735 Harland, S. C.
**Breeding for *Verticillium* resistance in Peruvian cotton.**
Emp. Cott. Gr. Rev. 1957 : **34** : 161–69.

A brief account is given of work carried out with Tangüis cotton at the Callao Station, Peru, from 1945 to 1952. The resistant strain known as SNA249 was isolated during this period and has proved promising in bad wilt areas. The following summary is made by the author: "(1) Graded differences of a hereditary nature are present in progenies extracted from commercial Tangüis. (2) Experiments should not be confined to areas with heavy wilt infection but should be carried out in areas of light to moderate infection in order to record genetical differences which could be obscured by heavy infection. (3) Progenies from two-year-old plants are somewhat better than those from one-year-old plants. (4) With adequate replication there is a correlation between wilt attack of parent strain and wilt attack of sets of descendant progenies. (5) Progenies from plants which were living after three or four years in an infected area are superior to those from plants which were dead. (6) Selection of material from long lived but uninfected plants is indicated as the most practical initial source of material. (7) Examination of the 15 replications of 15 standard varieties of the variety trial of 1949–51 showed that after two years, the attack was from 69–88%. The two varieties considered as resistant (SNA249—No. "799") and LM12–40 were as badly attacked as the rest and no commercial variety could be considered as resistant. (8) Extensive tests of alternate lines of Control SNA248 and material from diverse sources (799, SNA242, Tangüis hybrids, 12–40, SNA247, 244 and CP46) comprising 682 progenies in all, revealed no lines remarkable for resistance, which is thus rare in commercial types. (9) Tests of 144 progenies of diverse types of *Gossypium barbadense* (Algodón del País, Egyptian, Tangüis Plateado) and Upland brought to light some promising material for further work: Yauca 119—Algodón del País, Plateado 236—a type of Tangüis, and Egyptian—Pima and Karnak. (12) Tests of commercial varieties confirmed the greater resistance of Egyptian Karnak and Pima, as compared with current Tangüis."

736 Lebedev, V.
**(The effect of biological properties of the plants and ecological factors upon the resistance of cottons to *Eryophyes gossypii*).**
Hlopkovodstvo (Cott.-raising) 1957 : No. 6 : 40–42. [Russian].

Resistance of different cotton varieties to *E. gossypii* is discussed in relation to the anatomical and physiological properties of the plants and also to agricultural methods.

737 Wannamaker, W. K., Wessling, W. H. & Stephens, S. G.
**Boll-weevil-resistant cotton ?**
Res. & Fmg. 1957 : **16** : No. 1 : p. 14.

Some resistance to boll weevil (*Anthonomus grandis*) has been found in two hairy cotton lines, MU–8 with coarse hair and Pilrose with short pubescence, and the progeny of a cross between them is undergoing tests for resistance to this pest in North Carolina. A different gene pair has been found to control hairiness in each line.

738 Stephens, S. G.
**Sources of resistance of cotton strains to the boll weevil and their possible utilization.**
J. econ. Ent. 1957 : **50** : 415–18.

In this review the preference of *Anthonomus grandis* for certain species is mentioned. Observations made on the Upland group of *Gossypium hirsutum* cottons are recorded. These show that red plant colour, which is determined by the dominant gene $R_1$, increased hairiness, controlled by two dominant genes, $H_1$ and $H_2$, and absence of stem glands, a recessive character, *gl*, render cotton less attractive to boll weevils.

739 Wannamaker, W. K.
**The effect of plant hairiness of cotton strains on boll weevil attack.**
J. econ. Ent. 1957 : **50** : 418–23.

Field trials were made in North Carolina on a series of hairy Upland cottons including $F_1$ hybrids between Pilrose and other hairy types with special reference to resistance to *Anthonomus grandis*. MU8 and Pilrose, which carry the major genes for hairiness, $H_1$ and $H_2$ respectively, were significantly more resistant to attack than the other types. Certain unknown intensifying genes seem to supplement the action of $H_1$ and $H_2$. It is suggested that certain hair characteristics, such as distribution, density and length, influence the resistance to the boll weevil.

740 **Flax variety trials.**
Leafl. Minist. Agric. N. Ire. 1957 : No. 74 : Pp. 6.

The results of trials of new varieties against the standards Stormont Gossamer and Liral Prince at six centres in Northern Ireland are summarized. Norfolk Earl, Norfolk Queen, Norfolk Princess and Norfolk Mandarin were inferior to the standards in all respects. Several Dutch varieties have been tested for varying numbers of seasons. Wiera has given a particularly good all-round performance.

741 **Bolley flax.**
What's New Crops Soils 1957 : **9** : No. 9 : 26–27.

Bolley has a higher yield and oil content than Marine; it matures slightly later. The source of its rust resistance is different to that of other commercial varieties.

742 Klav, N. I.
**(For persistent improvement of the yield and quality of flax).**
Lën i Konoplja (Flax & Hemp) 1957 : No. 5 : 19–23.

Descriptions are given of two standards in the Kalinin province. 17 is resistant to drought and *Fusarium* wilt and is 6–8 days earlier than L1120, which is notable for resistance to lodging. Both varieties are characterized by high yields of seed and good quality fibre.

743 Padmanabhan Narayanan Nair
**Factors affecting resistance of flax to *Fusarium lini* Bolley.**
Diss. Abstr. 1957 : **17** : Publ. No. 20,528 : p. 942. (Abst.).

When stems of seven flax varieties were inoculated at the University of Minnesota with four races of *F. lini*, each race was found to behave differently in each variety, the growth of any one race in the host being nearly proportional to the susceptibility of that host when planted in infested soil. When plants of B5128 and Punjab were inoculated with equal amounts of mixed inoculum of two races a difference in the pathogenicity of the two races was observed, one of them eventually predominating. This was especially marked in the case of B5128 and it is suggested that continuous planting of a variety in the same field may result in the increase of certain races in the soil. In three varieties greater susceptibility was noted in a soil of pH 5·5 to 7·5 than at higher or lower pH values and seedlings of B5128 and Redwood showed decreased resistance when maleic hydrazide, thiourea and 2,4-dinitrophenol were added to the soil. Histological studies showed that in susceptible varieties the fungus penetrated the phloem and xylem while in resistant varieties it was restricted to the cortex.

744 Senčenko, G. I. & Gurzij, E. S.
**(A new method in hemp breeding).**
Lën i Konoplja (Flax & Hemp) 1957 : No. 5 : 32–34. [Russian].

Gluhov 1 was obtained by a method combining single-plant selection with family-group selection on the basis of high stem yield and high fibre content in the stems. It yields 49·1 c. stems and 10·74 c. fibre per ha. as against 46·7 c. and 8·75 c. respectively from the initial form, but it ields 0·8 c. less seed per ha. and matures two ays later.

45 Datta, R. M.
**Comparative studies on the rates of the pollen tube growth of the two cultivated jute species (*Corchorus olitorius* Linn. and *C. capsularis* Linn.) in vitro.**
Indian agric. 1957 : **1** : 39–44.

The pollen tubes of both species showed rapid growth *in vitro* in the first hour, followed by slow growth in the next half hour, after which growth practically ceased. The rate of growth was however greater in the longer-styled species *C. olitorius* than in *C. capsularis.*

746 Chaudhuri, S. D. & Mia, A. J.
**Effect of water treatment on the development of periderm in *Corchorus.***
Pakist. J. Sci. Res. 1957 : **9** : 33–38.

Plants were partially submerged for 72 hrs., when they were 12, 15 and 30 days old and when they were flowering. D154, Fanduk, Japan and Roxa, varieties of *C. capsularis*, produced between two and five layers of periderm. The variety CG of *C. olitorius* produced two layers of periderm.

747 Tachibana, Y., Sakazaki, N. & Ihara, Y.
**(Studies on *Hibiscus* plants. II. On compatibility and hybridization. 1).**
Engeigaku Kai Zasshi/J. hort. Ass. Japan 1957 : **25** : 255–60. [Japanese].

Self, intervarietal and interspecific compatibility was investigated in 8 species. The only interspecific combinations producing seed were *H. mutabilis* x *H. moscheutos* and *H. coccineus* x *H. moscheutos.*

748 Pulsifer, H. G.
**Anthracnose of kenaf caused by *Colletotrichum hibisci* Poll.**
Iowa St. Coll. J. Sci. 1957 : **31** : 504–06. (Abst.).

During the course of this study it was observed that under natural infection by *C. hibisci* in the field no plants of *Hibiscus cannabinus* var. *purpureus* showed any stem lesions or tip blight, while 22·5% of plants of *H. cannabinus* var. *ruber* and 35·8% of *H. cannabinus* var. *vulgaris* showed either stem lesions or tip blight or both.

749 Eberle, P.
Spiralen und Chromomeren in der frühen Prophase der Meiosis von *Aloe eru* Berger. **(Spirals and chromomeres in early meiotic prophase in *A. eru* Berger).**
Chromosoma 1957 : **8** : 573–84.

The following sequence of events from the premeiotic stage to pachytene was observed in pollen mother cells of *A. eru.* The thread-like, loosely spiralled premeiotic chromosomes, showing differentiation into euchromatic and heterochromatic segments, became extended to their fullest length during leptotene, towards the end of which phase meiotic spiralization began, apparently occurring earlier in strongly heterochromatic than in euchromatic regions. During the course of spiralization pairing takes place, the bivalents thus formed being of an anorthohelical structure which will permit later separation. Chromomeres were seen from leptotene to pachytene and appear to be the highly contracted spiralized heterochromatic segments of the chromosomes.

750 Richardson, J. M.
**The fibres of *Australimusa* in relation to abacá improvement.**
Trop. Agriculture, Trin. 1957 : **34** : 207–15.

The tensile strength and thickness of the fibres have been determined at the Imperial College of Tropical Agriculture, Trinidad, for a number of *Australimusa* species and hybrids between them and for certain other members of the genus *Musa.* It is suggested that crosses of *M. textilis* with *M. peekelii*, *M. angustigemma* and *M. lolodensis* may be of value in breeding for improved fibre quality.

751 **Annual Report of the Tanganyika Sisal Growers' Association, Sisal Research Station, Mlingano, Ngomeni, for the year 1956** : Pp. 39.

Trials are being continued with *Agave* hybrids. Yield data are provided for the hybrid *A. amaniensis* x *A. angustifolia* (11648); it is thought that on a plantation scale this hybrid would yield twice as much as sisal.

752 Bemelmans, J.
*Phormium tenax* Forster. Culture et industrialisation. **(*Ph. tenax* Forster. Cultivation and industrialization).**
Ann. Gembl. 1957 : **63** : 211–39.

From the literature, brief summaries have been prepared of the genetics of this species and of the descriptions of its varieties. Data are provided on the yield obtained in Brazil and New Zealand from several varieties.

## SUGAR AND STARCH PLANTS

753 Brett, P. G. C. & Thomson, G. M.
**Present indications of the comparative yielding ability and disease resistance of the more important sugarcane varieties of South Africa.**
S. Afr. Sug. J. 1957 : **41** : No. 6 : Suppl. Pp. 4 : Bull. Exp. Sta. S. Afr. Sug. Assoc. No. 3.

Plot trials on a number of varieties have been carried out in the four main agroecological areas of the Cane Belt. The yields of sucrose per acre have been measured and shown on a pictogram. The reactions of the different varieties to important diseases are shown in a second pictogram.

754 **Natal Estates, Ltd., favour green manuring policy.**
S. Afr. Sug. J. 1957 : **41** : 437–41.

A report is presented of the yield in tons of cane and tons of sucrose per acre for all the varieties grown in this area. These varieties are briefly discussed with respect to general performance and resistance to disease.

Rapport Annuel de l'Institut de Recherches sucrières, 1956. (**Annual Report of the Sugar Research Institute, 1956**).
Rev. agric. Maurice 1957 : **36** : 68–101.

755 *Wiehe, P.O. I. Introduction.* (*pp. 68–76*).
Varieties which have proved to be successful in this area are mentioned and recommendations are made for certain areas. Varieties are discussed with respect to their resistance to smut, *Fusarium moniliforme* (*Gibberella fujikuroi*), ratoon stunting, chlorotic streak and gummosis.

756 *Sornay, A. de. II. Travaux d'amélioration et de sélection de la canne en 1956.* (*II. Work on the improvement and breeding of sugar cane in 1956*). (*pp. 77–80*).

At Réduit and in Pamplemousses, local and imported varieties are being used to produce interspecific and intraspecific hybrids of complex origin. Progeny resulting from crosses between certain varieties used as mother plants and one other variety used as pollen parent are being compared with the progeny produced when the varieties used as mother plants are self fertilized. Richelieu varieties appear to be more effective as pollen parents than those from Réduit. Field trials have been made with the varieties M29/43, M147/44 and M31/45. M147/44 appears to be tolerant of various climatic conditions and M31/45 to be a vigorous plant suitable for regions with above-average rainfall. Both these varieties produce new shoots rapidly. B3337 has shown most promise amongst the Barbados varieties tested.

757 *Parish, D. H. & Feillafe, S. M. III. Nutrition et sols.* (*III. Nutrition and soils*). (*pp. 81–84*).

Varietal differences have been found in the Ca, Mg and K content of the juice. Little difference has been found in P content.

758 Hayot, H.
Résultats préliminaires des champs d'essai récoltés en 1956 à la Martinique. (**Preliminary results obtained from the trial fields in 1956 in Martinique**).
Rev. agric. sucr. rhum. Antilles franç. 1956 : **1** : 63–64.

A list is presented of varieties which have given high yields of cane or good quality juice in northern or southern Martinique. B37.172 has been found superior in all parts of Martinique with respect to yield of sugar per ha.

759 Fretay, E.
Programme de plantation de variétés nouvelles adaptées aux conditions de la Guadeloupe. (**A programme for planting new varieties adapted to the conditions of Guadeloupe**).
Rev. agric. sucr. rhum. Antilles franç. 1956 : **1** : 139–44.

The yield of cane and sugar is recorded for a number of sugar-cane varieties in several localities.

760 Stehlé, H.
Nouvelles variétés de cannes en observation phytosanitaire à la Guadeloupe. (**New varieties of cane under observation for condition of health at Guadeloupe**).
Rev. agric. sucr. rhum. Antilles franç. 1956 : **1** : 151–55.

Data have been compiled from the results of tests held in Barbados to show how the two new varieties B54.01 and B54.11 compare with B37.161, B41.211 and B47.44. Details are given on the general performance and yield of cane and sugar per ha. for these varieties, grown in a high rainfall area of Barbados. In tests at Beauport, B47.44 gave the best performance; it is considered most promising for dry regions such as Grande-Terre.

61 MATHERNE, R. J. & HEBERT, L. P.
**Results of sugarcane variety tests in Louisiana during 1956.**
Sug. Bull., N. Orleans 1957 : **35** : 309–22.

The results of tests of commercial and unreleased CP canes at several centres in Louisiana are summarized. CP44/101 and N.Co.310 continued to give good performances [cf. XXVI, 508]. Of the unreleased varieties, CP52/68 was the most promising.

762 STAFFORD, T. J.
**Outfield sugarcane variety trials—1956.**
Sug. Bull., N. Orleans 1957 : **35** : 340–57.

Trials of a number of varieties have been carried out under different environmental conditions on commercial plantations in Louisiana. The results are presented and discussed in some detail. The yields from CP48/103, N.Co.310 and CP47/193 all compare favourably with that of CP44/101.

763 HALMA, M.
Statistieken omtrent de suikerrietaanplant over de jaren 1956 en 1957. (**Statistics on sugar-cane plantations in the years 1956 and 1957**).
Meded. Java-Suikerindustr. 1957 : No. **1** : Pp. 88.

This report includes tables showing the first and second-cut yields of various varieties grown in Java.

764 STEVENSON, G. C.
**Report on a visit to Hawaii, April-May, 1956.**
Bull. Brit. W. Ind. Sug. Cane Sta. 1956 : No. 38 : Pp. 13.

The methods of sugar-cane breeding and variety testing adopted in Hawaii are briefly described and discussed.

765 KANDASWAMY, P. A. & RAO, J. T.
**Functioning of haploid gametes in the cross *Saccharum officinarum* x *Saccharum spontaneum*.**
Curr. Sci. 1957 : **26** : 217–18.

Three seedlings were obtained by crossing *S. officinarum* 'Vellai' ($2n = 80$) with *S. spontaneum* 'Uganda' ($2n = 120$). In some morphological characters, the hybrids were intermediate between the parents and in others they resembled one or other of them. All the seedlings had $2n = 100$; 50 chromosomes were visible at metaphase in the pollen mother cells of one hybrid. This indicated that in both parents haploid gametes had functioned.

766 PRICE, S.
**Cytological studies in *Saccharum* and allied genera. III. Chromosome numbers in interspecific hybrids.**
Bot. Gaz. 1957 : **118** : 146–59.

Chromosome numbers are reported for 58 true hybrids representing combinations of *S. officinarum* x *S. robustum*, *S. officinarum* x *S. spontaneum*, *S. sinense* (Pansahi group) x *S. officinarum*, *S. officinarum* x *S. sinense* (Saretha group), *S. robustum* x *S. spontaneum* and *S. sinense* (Sunnabile and Saretha groups) x *S. spontaneum*. The results of previous investigators were usually confirmed. Aneuploid numbers deviating greatly from expected numbers were found only in false and doubtful hybrids. The 24 hybrids of *S. officinarum* ($2n = 80$) x *S. robustum* ($2n = 80$) studied all had $2n = 80$ ($n + n$). Chromosome numbers are reported for the first time for the following types of hybrids: *S. officinarum* x *S. spontaneum* ($2n = 96$), $2n = 88$ ($n + n$) and 128 ($2n + n$); *S. officinarum* x *S. spontaneum* ($2n = 128$), $2n = 144$ ($2n + n$); *S. sinense* (Pansahi group, $2n = 116$–$120$) x *S. officinarum*, $2n = 93$–$98$ ($n + n$) and 130–138 ($n + 2n$); and *S. sinense* (Sunnabile group, $2n = 116$–$117$) x *S. spontaneum* ($2n = 64$), $2n = 95$–$99$ ($n + n$). Literature dealing with chromosome numbers in interspecific and intergeneric hybrids of *Saccharum* is reviewed and discussed.

767 SASTRY, S. K.
**An extra hundred rupees per acre with Co. 467.**
Indian Fmg. 1957 : **7** : No. 3 : 6–7.

The new cane Co. 467 was tested in various parts of Hyderabad. It has proved superior to Co. 419 in many respects, including yield of cane from winter and monsoon-planted crops and from ratoon crops. Co. 467 is particularly suited to heavy soils and is resistant to smut.

768 HAYOT, H.
Paiement des cannes à la richesse. Expérience de la Dillon. (**Payment for canes on the basis of richness in sugar. An experiment at La Dillon**).
Rev. agric. sucr. rhum. Antilles franç. 1956 : **1** : 85–89.

A number of varieties were analysed and considerable differences were found in the percentage of juice in the canes. B43.62 had the highest percentage: 73·6%.

769 Sun, V. G. [Sun, F.-C.] *et al.*
**(Report on earthing-up trials of autumn-planted sugar cane).**
Tai-wan Tang-yeh Shih-yen-so Yen-chiu Hui-yen/Rep. Taiwan Sug. Exp. Sta. 1956 : No. 14 : 1–15. [Chinese].

Some evidence was obtained from experiments conducted in 1953–5 that varieties may differ in the extent to which they benefit from one or three earthings up.

770 Davidson, L. G.
**Fertilizer investigations on sugar-cane in 1956.**
Sug. Bull., N. Orleans 1957 : **35** : 358–65.

The response to different rates of nitrogen fertilization was determined for several varieties. CP44/107 showed the greatest response; N.Co.310 and CP36/13 also gave increased yields with the higher rates of nitrogen. CP48/103, CP36/105 and CP44/55 gave no response.

771 Badruddoza, K. M.
**Studies on the isolates of *Physalospora tucumanensis* Speg.**
Diss. Abstr. 1957 : **17** : Publ. No. 20,608 : p. 954. (Abst.).

Some cultural differences are reported between light and dark isolates of the above fungus. No consistent differences were found between the isolates in respect of their longitudinal growth in the stems of all varieties of sugar cane tested.

772 Schexnayder, C. A. & Abbott, E. V.
**Study during 1956 of the effects of stunting disease on yields of cane and sugar in Louisiana.**
Sug. Bull., N. Orleans 1957 : **35** : 334–39.

Tabulated data are presented for the loss in yield caused by ratoon stunting disease in some commercial and unreleased varieties. The possible contribution of this disease to the decline of certain varieties is discussed. CP52/68 appears to be highly resistant.

Infected plants of CP36/105 and CP43/47 showed marked increase in yield after heat treatment [cf. XXVII, 2056].

773 Peregudov, N. I.
**(A valuable sweet sorghum variety).**
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1957 : No. 1 : 42–44. [Russian].

Stavropol' 98 (♀ Jantar' 25 [Amber 25] x ♂ Jantar' Rannij Dnepropetrovskij [Dnepropetrovsk Early Amber]) outyields its ♂ parent, which is a standard in the Stavropol' territory, and has a higher sugar content.

774 **Strains of sugar beet. Recommended list.**
Fmrs' Leafl. nat. Inst. agric. Bot. 1957 : No. 5 : Pp. 4.

Descriptive notes are given on strains recommended for Great Britain on the basis of the results of trials carried out by the National Institute of Agricultural Botany in cooperation with the British Sugar Corporation.

775 Fridman, S. E.
**(Increase the sugar content of beet).**
Nauk. pered. Opyt. sel'sk. Hozajstv. 1957 : No. 7 : 62–64. [Russian].

Reference is made to varieties of sugar beet in the USSR which yield 350–400 c. of roots per ha., with a sugar content of 18% and more. Efforts are being made to improve the sugar content of the monogerm varieties and the use of hybrid seed is recommended for increasing yields; some common defects of sugar-beet growing in the collective farms are mentioned.

776 Elagin, M. N.
**(The beet-growing exhibit in the "Sugar" pavilion).**
Sahar. Svekla 1957 : No. 7 : 5–9. [Russian].

Among the exhibits at the Moscow Agricultural Exhibition were the new sugar-beet standards Verhnjačka 038, Verhnjačka 031 and Ramon' 023. They have a high sugar content and yield more sugar per given area than other varieties when cultivated in squares.

777 Beysel, D.
Assimilations- und Atmungsmessungen an diploiden und polyploiden Zuckerrüben. **(Measures of assimilation and respiration on diploid and polyploid sugar beets).**
Züchter 1957 : **27** : 261–72.

In the commercial variety Polybeta, which comprises $2n$, $3n$ and $4n$ plants, cut leaves of the triploids had the highest assimilation rate and the tetraploids the lowest when the plants had been grown with low humidity, the diploids being intermediate. When cut leaves were supplied with unlimited humidity however the tetraploids had the highest assimilation rate and the triploids the lowest.

The respiration rate was highest in the tetraploids and lowest in the triploids under humid conditions, the diploids being intermediate; under conditions of water deficiency the triploids again had the highest rate and the tetraploids the lowest.

Newly produced tetraploids of the variety Beta 242/53 and of breeding line 205 showed no significant differences in metabolic activity compared with the diploids, though an analysis of the data for individual plants showed that some of them had higher assimilation rates when supplied with high humidity. The greater differences in Polybeta are ascribed to the effect of selection that has taken place since the polyploidy arose. Cell size increased proportionally to genome number, so that differences in metabolic activity cannot be the direct result of changes in cell size. Field tests are referred to which show that the yields of 100 roots of the diploids, triploids and tetraploids in Polybeta were 0·972, 1·060 and 0·753 kg. respectively and the two sets of data are taken as showing that the highest yielding potentialities under ordinary conditions of cultivation are to be found in the triploids.

778 ROSENTHAL, C.
Beobachtungen über die Mikrosporenbildung oktoploider Beta-Rüben. **(Observations on the microsporogenesis of octoploid beets).**
Züchter 1957 : **27** : 280–84.

Octoploids were produced in four varieties of fodder sugar beet by colchicine treatment; their anthers failed to dehisce and no progeny were obtained from them; the octoploids of Rosekraag Zeelandia [Pink-necked Zeelandia] showed more pronounced anthocyanin development than the diploids. Those pollen grains that formed were below the normal size and did not stain in acetocarmine. Two fairly normal plates with 36 chromosomes were observed in a number of pollen mother cells at metaphase II but aberrations usually occurred at telophase II and the number of cells arising at the "tetrad" stage varied from 4 to 12. In view of their complete female sterility it is assumed that the octoploids are equally abnormal in the formation of the embryo sac.

779 ZOSIMOVIČ, V. P.
**(Supplementary pollination of seed beets).**
Sahar. Svekla (Sug. Beet) 1957 : No. **6** : 37–40. [Russian].

Soviet research on supplementary pollination of the sugar beet is briefly discussed, especially in relation to improvements observed in seed quality and root and seed yields. The writer's own experiments with the tonnage variety I1305 involved the use of large or small amounts of mixed pollen, consisting of self pollen + mangel or Z type + mangel. In both instances the large amount of pollen gave an increase in root weight and reduction in the sugar content.

780 ORLOVSKIJ, N. I.
**(Monogerm sugar beet).**
Dokl. Vsesojuzn. Akad. sel'skohozjajstv. Nauk Lenin. (Proc. All-Un. Lenin Acad. agric. Sci.) 1957 : No. **3** : 7–13. [Russian].

Recent work on improvement of productivity of monogerm sugar-beet varieties at the Jaltuškov Breeding Centre and other Soviet institutes is discussed. Reference is made to recent trials of Jaltuškovskaja Odnosemjannaja R56–555 [Jaltuškov Monogerm R56–555] which proved more productive of roots and sugar per ha. than the multigerm standards Ja02 and R06.

781 BUZANOV, I. F.
**(The monogerm sugar beet—on to the fields of the collective and state farms).**
Sahar. Svekla (Sug. Beet) 1957 : No. **6** : 4–9. [Russian].

Mention is made of new monogerm varieties from Belaja Cerkov' with a sugar content of 17·5% and root yields of the order of 629 c. per ha.

782 SMITH, P. B.
**Tips and trends. The story behind the new G-W monogerm seed.**
Thr. Leaves 1957 : **45** : No. **3** : 5–12.

A popular account is given of research carried out by the Great Western Sugar Company, Colo., on mechanical equipment, chemical weed control and planting conditions in connexion with the best utilization of monogerm varieties. It is expected that seed of only monogerm varieties will be produced by 1961 by the company for commercial sowing. The method used for seed production from selected stecklings is outlined. Some information is also given on the large assortment of inbreds under test for their value for the production of disease-resistant hybrids giving high yields of sugar per acre.

783 LÜDECKE, H. & NITZSCHE, M.
Über Nährstoffaufnahme, Nährstoffentzug und Nährstoffverhältnis unter Berücksichtigung der Zuckerbildung und des Reifezustandes bei verschiedenen Zuchtrichtungen der Zuckerrübe. **(On nutrient uptake, removal and ratio with regard to the formation of sugar and the degree of maturity in different lines of sugar beet).**
Zucker, Hannover 1957 : **10** : 369–74.

The lines N, Z, E and Polybeta were investigated with reference to the following nutrients: N, K, Ca, Mg, Na and P. Marked differences were found in the nutrient content of these four lines at different stages of growth; these differences are recorded in detail.

784 SCHNEIDER, C. L.
**Studies on the pathogenicity and host range of the sugar beet black root fungus, *Aphanomyces cochlioides* Drechs.**
Diss. Abstr. 1957 : **17** : Publ. No. 19,228 : p. 735.

The results described include the following. The relative susceptibility of sugar-beet strains to *A. cochlioides* was best determined when about 100,000 zoospores in aqueous suspension were applied to each 4-inch pot of seedlings about 15 days after planting in autoclaved soil. Greenhouse inoculation tests were effective in eliminating the most susceptible strains but did not offer a means of precise differentiation among resistant strains. Mass inoculation of sugar-beet seedlings in the field was accomplished by placing infected oat grains in the drill rows at planting. In greenhouse and field tests, differences in susceptibility were found among varieties of garden beet, mangel and chard; none of these varieties was immune or more resistant than sugar-beet varieties developed for resistance. Evidence of physiological specialization was obtained.

785 JENNINGS, D. L.
**Further studies in breeding cassava for virus resistance.**
E. Afr. agric. J. 1957 : **22** : 213–19.

Further crossing between varieties of *Manihot esculenta* from various countries has been carried out at Amani, Tanganyika, but no improvement in virus resistance was obtained. Interspecific hybridization has been continued with the following results:—

(1) *M. glaziovii* x *M. esculenta.* The hybrids from this cross were vigorous, tree-like plants showing only mild or transient mosaic symptoms. One clone from a back cross to *M. esculenta* '4032' remained free from both mosaic and brown streak in field trials and grafting tests. Several back-cross hybrids are also promising agronomically, giving large tuberous roots which in the third back-cross generation are of satisfactory palatability. While not immune to brown streak the resistance of these hybrids is adequate for all the areas in East Africa where they have so far been tested.

(2) *M. dichotoma* x *M. esculenta.* Although remaining largely mosaic-free, $F_1$ hybrids from this cross showed generally poor growth and poor seed setting. Some improvement in agronomic characters was achieved by several back crosses to *M. esculenta* and crosses between these lines and third back-cross *M. glaziovii* hybrids possess high mosaic resistance and give improved yields.

(3) *M. esculenta* x "tree" cassava. Hybrids and back-cross lines from this cross are inferior both in respect of disease resistance and agronomic characters.

(4) *M. catingea* x *M. esculenta.* Mild and transient mosaic symptoms have been shown by $F_1$ progeny from this cross and their brown-streak resistance is also good but their roots are woody. Crosses with resistant clones of *M. esculenta* x *M. melanobasis* have resulted in plants with improved root characters without loss of virus resistance.

(5) *M. saxicola* x *M. esculenta.* Palatable sweet roots have been obtained after three back crosses to cassava, although the roots of *M. saxicola* have a high hydrocyanic acid content, but the hybrids are susceptible to mosaic.

(6) *M. melanobasis* x *M. esculenta.* The $F_1$ plants from this cross show the vigour and brown-streak resistance of *M. melanobasis* and give higher root yields than their *M. esculenta* parents but are only moderately resistant to mosaic. The most promising progeny have been obtained by crossing $F_1$ selections from this cross with third back-cross ceara hybrids. In all cases considerable variation has been observed in the behaviour and disease reaction of the hybrids in different localities although there is no evidence for the existence of different strains of the virus. Improvements in the method of experimentation and the estimation of resistance are reported and problems of virus behaviour in relation to breeding are discussed [cf. XVII, 996].

786 BARRAU, J.
Les aracées à tubercules alimentaires des îles du Pacifique sud. (**Araceae with edible tubers from the islands of the southern Pacific**).
J. Agric. trop. Bot. appl. 1957 : **4** : 34–52.

The genera *Cyrtosperma*, *Amorphophallus*, *Alocasia*, *Colocasia* and *Xanthosoma* have been studied. Useful species and varieties are described and their local names are listed.

## STIMULANTS

787 SCHWARTZ, D., FARDY, A. & CUZIN, J.
Résultats obtenus en sélection par la méthode des caractères liés. (**Results obtained in breeding by the method of linked characters**).
Ann. Inst. exp. Tab. Bergerac 1956 : **11** : No. 3 : 125–29.

[Cf. XXVII, 3309].

788 POPOV, M. D.
**(Heterotic effects in tobacco).**
Izv. Inst. Biol. Popov/Bull. Popoff Inst. Biol. 1956 : **7** : 141–48. [Bulgarian].

A description is given of a hybrid of Virginia Bright x Kozarsko from the Biological Institute of the Bulgarian Academy of Sciences. It has a shorter growth period than the seed parent and outyields it by 52·4%. The leaf is large, of fine quality and has an aroma resembling that of the pollen parent.

789 IZARD, C. & HITIER, H.
Obtention d'un amphidiploide naturel: *N. tabacum* L. (Var. Corolle double x) x *N. sylvestris* Speg. et Comes. [**Production of a natural amphidiploid: *N. tabacum* L. (var. Double Corolla x) x *N. sylvestris* Speg. et Comes**].
Ann. Inst. exp. Tab. Bergerac 1956 : **11** : No. **3** : 143–47.

A spontaneously originating amphidiploid of the above cross is described. The plant was fertile and gave rise to 83 offspring. The chromosome number of the latter varied from 69 to 72 and meiotic irregularities were frequent.

790 IZARD, C.
Obtention et fixation de lignées tumorales et non tumorales à partir de mutations expérimentales de l'hybride *N. glauca* x *N. langsdorffii*. (**Production and fixation of lines with and without tumours from experimental mutations of the hybrid *N. glauca* x *N. langsdorffii***).
Rev. int. Tabacs. 1957 : **32** : 137–38.

This paper has been summarized already from another source [XXVII, 4252].

791 BENOIT, R.
La culture du tabac à la Réunion. (**The cultivation of tobacco in Réunion**).
Rev. int. Tabacs 1957 : **32** : 103–06.

This general account includes brief descriptions of two local varieties.

792 MEISELMAN, N.
**The effects of chronic gamma radiation upon two species of *Nicotiana* and their interspecific hybrid. I. Chromosomal aberrations and radiation sensitivity. II. Morphological aberrations and radiation sensitivity.**
Diss. Abstr. 1956 : **16** : Publ. No. 18,478 : p. 1784.

*N. bigelovii* ($2n = 48$), *N. glauca* ($2n = 24$) and *N. bigelovii* x *N. glauca* ($2n = 36$) were exposed to chronic $\gamma$ radiation at dosages ranging from 37·5 to 375 r. per day at the Brookhaven National Laboratory, New York. Within each of the three stocks, the frequency of chromosomal aberrations, as indicated by anaphase-bridge and fragment counts in leaf tissue, showed no significant increase, after an initial 15-day exposure, as the time of exposure at the particular dosage increased. The spontaneously-occurring chromatin bridges in the hybrid did not account for the greater rate of increase in frequency of aberrations with increasing dosage in this stock, as compared with its parents. The percentage of chromosomal aberrations in *N. bigelovii* at each dosage was approximately twice that in *N. glauca* at the corresponding dosage. The hybrid had approximately four times the frequency of aberrations found in *N. glauca* at a given dosage. With irradiation, the hybrid was morphologically the least stable but, in spite of its greater cytological stability when irradiated, *N. glauca* was less morphologically stable than *N. bigelovii*. Possibly some factor introduced through *N. glauca* rendered the hybrid less physiologically stable under both normal conditions and irradiation.

793 RADHAKRISHNA MURTY, B. & SWAMINATHAN, M. S.
**Intraspecific differentiation in *Nicotiana tabacum*.**
Indian J. Genet. 1956 : **16** : 88–97.

Microsporogenesis and pollen and seed fertility were studied in eight varieties of *N. tabacum* and three $F_1$ intervarietal hybrids. Minor irregularities were observed at meiosis in some varieties. In the hybrids, meiotic aberrations were observed suggesting that both cryptic structural changes and translocations and inversions had been responsible for intraspecific differentiation.

794 TAKENAKA, Y.
**(Cytogenetical studies in *Nicotiana*. X. Meiosis in *N. Langsdorffii*).**
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1956 : **69** : 162–65. [Japanese].

A detailed description is given; the preliminary report on this species was included in a paper already summarized [XXVII, 1252].

795 TAKENAKA, Y. & TANAKA, M.
**(Cytogenetical studies in *Nicotiana*. XIII. A haploid tobacco).**
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1956 : **69** : 193–98. [Japanese].

An extended account is given of investigations already summarized [XXVII, 3821].

796 Burk, L. G.
**Overcoming seed dormancy in *Nicotiana.***
Agron. J. 1957 : **49** : p. 461.

Soaking for 15 to 30 minutes in a 2% solution of sodium hypochlorite has been found to increase the percentage germination and decrease the dormancy period of seeds of several species and interspecific hybrids of *Nicotiana*.

797 Muraoka, Y. & Ohori, K.
**(Varietal differences in the development of tobacco under controlled thermal and photoperiodic conditions).**
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1957 : **25** : 151–53. [Japanese].

Six varieties were studied. Differences in the degree to which the vegetative period of the varieties was curtailed by short days and in the response to temperature were noted. The Japanese variety Okinawa was responsive neither to photoperiod nor temperature.

798 Seehofer, F.
Die chemische Selektion einer grossen Pflanzenzahl ($10^5$). [**The chemical selection of a large number of plants ($10^5$)**].
Züchter 1957 : **27** : 244–45.

A selection method in which the following steps are employed is described: (1) a spot test of up to $10^5$ plants; (2) a modified spot test with semiquantitative colorimetric assessment of up to $10^3$ plants; and (3) an accurate chemical analysis of $10^1$–$10^2$ élite plants. In the example given, viz. selection for high sugar content with a high fructose/glucose ratio in Virginia tobacco, stage (1) involved expressing a drop of juice from a comparable leaf from each of the 40,000 plants of the population on to a sheet of chromatographic paper. The spots were sprayed with an alkaline solution of triphenyltetrazolium chloride, and the 400 plants whose spots were the first to appear on heating to 45° C. were selected. These 400 plants were then subjected to stages (2) and (3). The application of the method to selection for other chemical characteristics is discussed.

799 Heggestad, H. E. & Lautz, W. B.
**Some results of studies on resistance to tobacco black shank.**
Phytopathology 1957 : **47** : p. 452. (Abst.).

Evidence of pathogenic races of black shank was obtained. Beinhart 1000–1, a selection of the cigar type Quin Diaz, has shown more resistance to black shank than the cigar-wrapper variety Rg or Beltsville breeding lines with resistance derived from *Nicotiana plumbaginifolia*. In crosses of some of the lines with the susceptible Virginia Gold, more plants resistant to black shank were obtained with the lines used as ♂ parents than from the reciprocals.

800 Troutman, J. L.
**Resistance in tobacco to cucumber mosaic and other viruses.**
Diss. Abstr. 1957 : **17** : Publ. No. 20,650 : 944–45. (Abst.).

In studies at the University of Wisconsin, a wide range of resistance to cucumber mosaic was found among tobacco varieties but the $F_1$ and $F_2$ plants of crosses between susceptible and resistant plants were intermediate in reaction. The range of resistance shown by $F_2$ plants was greater than that of the $F_1$ plants indicating that some recombination of factors occurred and it is concluded that these factors lack dominance and are inherited in a manner similar to quantitative characters. A marked increase in the susceptibility of resistant plants was found when they were darkened for 24 hours before inoculation while only moderate increases in the susceptibility of susceptible plants resulted from this treatment.

801 Bahtadze, K. E.
**(Growing varietal seed of the tea plant in Georgia).**
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1957 : No. 2 : 53–60. [Russian].

Descriptions are given of newly bred tea varieties from the USSR Tea Institute, all of which outyield commercial strains. They comprise (1) large-leaved varieties, with high yield and fine quality which were obtained from crosses between Indian and Chinese forms, (2) moderately hardy varieties, from crosses between large-leaved Chinese strains and (3) very hardy hybrids between Chinese forms with medium-sized leaves.

802 Antunes Filho, H. & Carvalho, A.
**Genetics of *Coffea*. XVI. The variety *typica* as a standard for genetical studies of *Coffea arabica*.**
J. Hered. 1957 : **48** : 110–17.

A summary of this paper, now given in full, has been abstracted already [XXVII, 1404].

803 DUBLIN, P.
Recherches sur la floraison et la fructification du caféier de la "Nana". (**Researches on the flowering and fruiting of the coffee plant of the Nana**).
Agron. trop., Nogent 1957 : No. 2 : 173–208.

A detailed account is given of the floral biology of the coffee form found along the river Nana in French Equatorial Africa. The form pertains to *Coffea canephora* and has $2n = 22$ chromosomes. It appears to be self sterile but may be successfully crossed with Robusta.

804 HAARER, A. E.
**Economic species, varieties and forms of coffee.**
World Crops 1957 : **9** : 371–73, 381.

The taxonomic classification of *Coffea* is discussed with special reference to the difficulty of distinguishing cultivars from botanical varieties.

**Proceedings of the Cacao Breeding Conference held at the West African Cocoa Research Institute, Tafo, Ghana from 1st to 3rd October, 1956**
(1957) : Pp. 49.

805 *Dale, W. T. Studies on resistance and tolerance to cacao viruses.* (*pp. 3–6*).

Progress made at the West African Cocoa Research Institute in the search for immunity or resistance to the virulent New Juaben virus is reviewed [cf. XXII, 1342]. One Upper Amazon plant of Iquitos origin, T17, proved difficult to infect and some cuttings from $F_1$ plants derived by open pollination are virus-free. The $F_1$ trees fall into two compatibility groups between, but not within, which fertilization can occur and both groups are represented among the virus-free trees. A high degree of tolerance has been shown by some Nanay x Nanay progenies and it is hoped to recover virus-free material from them.

806 *Wharton, A. L. Black-pod disease—resistance and tolerance.* (*pp. 7–9*).

So far work on the problem of resistance and tolerance to *Phytophthora palmivora* has been limited to selection on the basis of routine crop and pod-disease records. Among the known sources of resistance or tolerance are a tree, Lafi 7, on the New Zealand Reparations Estate in Samoa, which is highly tolerant, clone 12B from the Cameroons which is reported to escape infection by bearing in the dry season, clone SIC28 from Brazil and ACU85 at the West African Cocoa Research Institute.

807 *McKelvie, A. D. W.A.C.R.I. Breeding material.* (*pp. 10–15*).

Breeding carried out at the West African Cocoa Research Institute since 1937 is reviewed [cf. XXVI, 2702]. Material available for breeding includes Central American Criollo, South American Criollo, Amazonian Forastero and the Trinitario complex and the best trees, as indicated by trials already carried out, are to be used as parents. A comparative trial has been set out including unselected and selected Amelonado, selected local hybrids, selected Upper Amazon, Amelonado x Upper Amazon and local hybrids x Upper Amazon. Considerable differences have been found in respect of growth, yield, bean weight and flavour; segregation of several characters has been observed in the progeny of the crosses.

808 *Glendinning, D. R. Techniques of breeding, experimental considerations.* (*pp. 16–19*).

Problems such as the degree of variability which can be tolerated within a population, correlation between growth and yield and the relative performances of pairs of varieties at different localities are briefly discussed with reference to cacao breeding.

809 *Rogers, H. H. Agricultural requirements as breeding characters.* (*pp. 22–25*).

The aims of a cacao breeding programme are discussed with reference to yield requirements, the characters which make for higher yields, pod shape and size and the response of the plant to its environment.

810 *Bell, G. D. H. & Rogers, H. H. Cacao breeding at W.A.C.R.I.* (*pp. 31–49*).

The aims of breeding, namely ecological adaptation, agricultural requirements, yield, disease resistance and quality, are discussed, work carried out at the West African Cocoa Research Unit reviewed and possible future programmes outlined.

811 COSTE, R.
Vue d'ensemble des problèmes posés par la culture cacaoyère et l'amélioration de sa production dans les territoires d'outre-mer. (**A general view of the problems set by the cultivation of cacao and the improvement of its production in the overseas territories**).
Café Cacao Thé 1957 : **1** : 5–9.

This general review states that in the Cameroons the variety 40 has produced high-yielding progeny from seed. The clone SNK109 has also given high yields.

812 GARCÍA, C.
Resultados de la selección de cacao en Colombia. (**Results of cacao selection in Colombia**).
Cacao en Colombia 1955 : **4** : 47–54.

This paper has been summarized from another source [XXVI, 1601].

813 BECERRA Z., C.
El programa de selección de cacao. (**The cacao selection programme**).
Cacao en Colombia 1956 : **5** : 61–71.

Information on the yields of the following series of selections is provided: series 1 and 2 at Palmira, the first comprising the four high-yielding clones SPC 1, 3, 5 and 6 and the second 17 clones yielding 128 to 295 fruits a year; series 1, 2 and 3 at Cauca, the first consisting of 44 clones giving average yields of 101 to 236·25 fruits and 3622·5 to 9549·2 g. dry cocoa per tree per year, the second of 8 clones with 183 to 218·5 fruits per tree per year, and the third of 23 clones with 182 to 362 fruits per tree per year; and three series at Tuluá, the first containing 9 clones of the Forastero type giving 95 to 151 fruits and 3471 to 7049 g. dry cocoa per tree per year, the second 20 clones giving an annual average of 150·5 to 268·5 fruits per tree, and the third 47 clones with average annual numbers of fruit per tree varying between 150 and 294.

814 ESQUIVEL CRUZ, S.
Influencia del boro sobre el crecimiento, desarrollo, polinización y fecundación del cacao. (**Influence of boron on the growth, development, pollination and fertilization of cacao**).
Cacao en Colombia 1955 : **4** : 63–83.

The effectuation of pollination and fertilization, as estimated from the number of flowers remaining six days after artificial pollination, was uninfluenced either by treating the flowers prior to pollination with solutions containing boric acid at various concentrations or by injecting the trees with boric acid solution. Pollen from injected trees did not differ from normal pollen in tube growth in culture. In culture media containing boric acid at concentrations of 0·0008–0·001%, growth of the tubes of pollen grains from an untreated tree was stimulated while at concentrations higher than 0·005% growth was inhibited.

815 ARANGO ACERO, J.
Influencia del zinc sobre polinización y fecundación en cacao. (**Influence of zinc on pollination and fertilization in cacao**).
Cacao en Colombia 1955 : **4** : 85–120.

Treatment of the stigma prior to pollination with solutions containing zinc at any concentration resulted in low fertilization. Fertilization was stimulated by injection of the trees before artificial self pollination with solutions at concentrations up to 0·025% and inhibited at higher concentrations. Pollen from injected trees did not differ from normal pollen in germination and pollen tube growth on glucose agar and that from trees injected with a 2% solution was able to effect normal fertilization of untreated trees. Germination of pollen from untreated trees was stimulated on glucose agar containing up to 0·001% zinc and was inhibited above 0·05%. No flowers on trees injected with 2% zinc solution were retained four days after pollination with normal pollen, indicating that either fertilization did not occur or zygote development was inhibited.

816 NAUNDORF, G.
Nuevas contribuciones al estudio de la auto-incompatibilidad en cacao. (**Further contributions to the study of self incompatibility in cacao**).
Cacao en Colombia 1955 : **4** : 59–61.

Of 53 self-sterile trees on to which flowering shoots from self-compatible trees had been grafted, 10 set seed by self pollination. The same method induced normal flowering and seed set in two completely sterile trees.

817 ORELLANA, R. C.
Enfermedades del cacao en América tropical. (**Diseases of cacao in tropical America**).
Agricultor venezol. 1955 : **20** : No. 180 : 22–27.

Diseases occurring in tropical America are described and notes provided on available resistant varieties. Among promising material undergoing tests in Ecuador are SCA 6, which is nearly immune from *Marasmius perniciosus*, SCA 9 and SCA 12, which are highly resistant, and ICS 1 and ICS 95 which in addition to being resistant give high yields. The Criollo type offers some resistance against *Monilia roreri*. Preliminary studies in Trinidad indicate that there are at least three races of *Phytophthora palmivora*. At Palmira, the clonal selection SCP 2 has shown good resistance to anthracnose (*Colletotrichum* spp.).

818 BAKER, R. E. D. & HOLLIDAY, P.
**Witches' broom disease of cacao (*Marasmius perniciosus* Stahel).**
Phytopath. Pap. Commonw. myc. Inst. 1957 : No. 2 : Pp. 42.

This review mentions current investigations on resistance to *M. perniciosus*. Of the Trinidad clones tested, ICS 95 shows most resistance. Certain Amazon clones, such as the self-sterile SCA 6 and SCA 12, are highly resistant. Attempts are being made to combine the high resistance of the Amazon Forastero trees with other desirable characters from the Trinitario group. Resistance appears to be physiological.

819 MONTSERIN, B. G., VERTEUIL, L. L. DE & FREEMAN, W. E.
**A note on cocoa hybridisation in Trinidad with reference to clonal selection and hybrid seed.**
J. agric. Soc. Trin. Tobago 1957 : **57** : 19–27.

Data are provided on the yield, pod value, bean weight and resistance to *Marasmius perniciosus* of a number of hybrids, which originated from crosses between Amazonian clones and between Amazonian and Trinitario clones. These seedlings gave high and early yields, although they were planted unusually close together. Many of the SCA6 crosses produced beans of satisfactory dry weight, i.e. greater than 1 gm. The cross SCA6 x IMC67 gave the highest percentage of trees immune to *M. perniciosus*; SCA6 was found to be a better source of resistance than any of the PA types.

Reciprocal differences in respect of such characters as bean and pod size and immunity to *M. perniciosus* were noted in the progeny of the cross SCA6 x ICS1. The characters of the female parent tended to be inherited more readily than those of the pollinator.

820 **Cacao research.**
J. agric. Soc. Trin. Tobago 1957 : **57** : 29–31.

Cuttings from certain Trinitario clones were found to give higher yields than hybrids arising from crosses between the same clones. High yields were obtained from hybrids produced by crossing the Trinitario clones ICS 1, ICS 6 and ICS 60 with the Amazonian clones SCA 6 and SCA 12. Progeny of SCA 6 were more resistant to *Marasmius perniciosus* than progeny of SCA 12. Pod size and bean weight for both SCA 6 and SCA 12 hybrids are rather small but superior to the parent SCA clones.

**Annual Report of the Department of Hop Research, Wye College, 1956**
(1957) : Pp. 100.

821 *Neve, R. A. & Farrar, R. F. Plant Breeding Section. Review of year's work.* (*pp. 16–20*).

Breeding for *Verticillium* wilt tolerance continued, and some selections are ready for field trials. The selections include crosses of Nonsuch (OB53), tetraploid Bullion and tetraploid Fuggle N with wilt-tolerant males. Diploid and tetraploid Eastwell Golding and diploid Fuggle N were successfully pollinated by wilt-tolerant males.

The yellow mutant gene of Brewer's Gold appears to be dominant to the normal green gene and may be used as a marker. Diploid Fuggle N was pollinated by a triploid male. Differences in the amount of seed set indicate that this may be a useful method for producing seedless hops.

822 *Thompson, F. C., Beard, F. H. & Cripps, E. G. Field Experimentation and Plant Nutrition Section. Review of the year's work.* (*pp. 21–26*).

Thirty-six varieties have been investigated in field trials at Wye. Data are given for yield and bushel/cwt. ratio. Notes were made of the effects of gales. Bullion and Northern Brewer have done well at Sissinghurst and are recommended to growers.

823 *Darling, H. S. & Thompson, F. C. The effect of machine picking on the resin content of hops—1956 crop.* (*pp. 44–49*).

Varietal response to the effect of machine picking is summarized in a table. The data are interpreted as suggesting that the Goldings and Keyworth's Midseason are less broken by machine picking than Fuggles and Golding varieties.

824 *Beard, F. H. The incidence of downy mildew* (Pseudoperonospora humuli) *in new seedling varieties of hops at Wye.* (*pp. 54–64*).

An account is given of the incidence of downy mildew during 1950–56 in 77 new varieties. CC77, a derivative of Oregon Cluster, was found to be most resistant. Descendants of New Mexican wild hop were found to be very resistant to rootstock infection, and derivatives of Manitoba wild hop and Oregon Cluster far more susceptible.

825 *Beard, F. H. & Derbyshire, D. M. The history of a Golding Hop garden at Wye during* 1949–1956 *with special reference to attack by downy mildew* (Pseudoperonospora humuli). (*pp. 65–72*).

The incidence of downy mildew spikes for 1951–53 is recorded for Early Bird Golding, Eastwell Golding and Petham Golding. Petham Golding appeared to recover more easily.

826 Jary, C. L. & Beard, F. H.
**The new varieties. A summary of the present position.**
Ann. Bookl. Ass. Growers New Var. Hops 1957 : 5–11.

Details are provided of the valuation, brewing demand, cropping capacity, general characteristics and other features of 11 hop varieties grouped under three headings: wilt sensitive, mosaic tolerant and new wilt-tolerant varieties still under trial [cf. XXVII, 2115].

827 Jacobsen, P.
**The sex chromosomes in *Humulus*.**
Hereditas, Lund 1957 : **43** : 357–70.

Meiotic and mitotic investigations indicated that sex differentiation depends upon two chromosomes in *H. lupulus*, X being longer than Y and medium-sized in relation to the autosomes. In *H. japonicus* three sex chromosomes, $Y_1$, X and $Y_2$, all longer than the autosomes, were distinguished. $Y_1$ and $Y_2$ are heterochromatic for the greater part of their length. In $Y_1$ the centromere is submedian and in $Y_2$ median. In the case of *H. lupulus* it was possible to make interpretations concerning homologies between individual segments of X and Y.

828 **Institute of Brewing hop trials : 1955 crop.**
J. Inst. Brew. 1957 : **63** : 312–15.

A report is given of the results of trials carried out on D1, D3, J2, OT48 (Bramling Cross) and V94 (Sunshine) by the Brewing Industry Research Foundation, England, in collaboration with commercial brewers. The varieties were studied with respect to physical appearance of the hops, contents of α-soft resin and total soft resins, and suitability as copper hops. D1, D3, J2 and OT48 were considered to be suitable as replacements of Fuggles to the extent of at least 25% of the hop grist. V94 may be less suitable than the other varieties for this purpose.

829 Garbuzova, D. A.
**(The hop variety Clone 18).**
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1957 : No. 1 : 44–46. [Russian].

Clone 18, selected from local material at Žitomir, is more productive and has a higher resin content than Zemševyj, Žateckij and other varieties cultivated in the Ukraine. It shows resistance to *Gibberella, Plenodomus* and *Fusarium*, otherwise shown only by Zemševyj.

830 Burgess, A. H.
**Soil requirements of some of the new varieties.**
Ann. Bookl. Ass. Growers New Var. Hops 1957 : 12–14.

Information from growers and the author's own observations on the soil preferences of seven hop varieties are discussed.

831 Beard, F. H.
**Downy mildew (*Pseudoperonospora humuli*) and the new varieties of hops.**
Ann. Bookl. Ass. Growers New Var. Hops 1957 : 26–29.

Notes are included on the susceptibility of eight widely grown varieties and new seedlings under trial at Wye to attack by the above pathogen.

## MINOR CROP PLANTS

832 Jeswani, L. M., Deshpande, R. B. & Joshi, A. B.
**Inheritance of some fruit characters in chilli.**
Indian J. Genet. 1956 : **16** : 138–43.

The cross NP64 x Goa 6–3–1 was investigated. Deciduous nature of calyx was found to be dominant over nondeciduous and appeared to be governed by a single gene pair. Cedar green colour in unripe fruit was found to be dominant to yellowish green with a 15 : 1 ratio. It is suggested that two duplicate genes control colour.

833 Hare, W. W.
**Inheritance of resistance to root-knot nematodes in pepper.**
Phytopathology 1957 : **47** : 455–59.

Crosses have been made at the Mississippi Agricultural Experiment station between two bell pepper varieties, Santanka xS and 405 B Mexico, known to be resistant to *Meloidogyne incognita, M. incognita* var. *acrita, M. javanica* and *M. arenaria* [cf. XXVII, 3354], and five commercial varieties susceptible to *M. incognita*. Data from $F_1$, $F_2$ and $F_3$ progeny indicate that resistance to *M. incognita* and *M. incognita* var. *acrita* is controlled by a single dominant gene, here designated *N*, which is probably identical in the two resistant varieties. It is not clear whether this gene also controls resistance to *M. javanica* and *M. arenaria* and comparison with a susceptible variety indicates that at least one other gene or gene complex is concerned with resistance to these two species.

834 PIQUEMAL, M.
Possibilités de développement et d'amélioration des cultures oléagineuses annuelles en Algérie. (**Possibilities of developing and improving the cultivation of annual oil-plants in Algeria**).
Bull. Renseign. agric., Alger 1956 : No. 30 : 3–11.

This review mentions breeding in progress and lists promising varieties. North African varieties of flax are being studied with the aim of producing tall forms. Perennial castor-oil varieties which have proved of interest are those of the *sanguineus* type such as Sanguin de Vérone [Verona Sanguineus], de Settat and Rouge de Fez [Fez Red]. Two years work on American varieties has indicated that annuals are more suitable for irrigated regions; they give lower yields than the perennials in non-irrigated areas. Italian M6 is superior to the American varieties but the Algerian populations are no longer homogeneous. Attempts are being made to increase the yield from varieties of poppy which have indehiscent capsules.

835 RUYSSEN, B.
Le karité au Soudan. (***Butryospermum parkii* in the Sudan**).
Agron. trop., Nogent 1957 : No. 2 : 143–72.

In this general account, local cultivars of *B. parkii* var. *mangifolium* are described. A list has been made of characters which appear to be correlated, with special reference to yield and quality of pulp and nuts.

836 SIKKA, S. M. & RAJAN, S. S.
**Breeding better brassicas.**
Indian Oilseeds J. 1957 : **1** : 73–81.

The aims of breeding *Brassica* oil crops in India are summarized briefly as higher yields, better resistance to pests and diseases and improved adaptation. Methods of breeding and selection are then outlined, mass pedigree selection, inbreeding by bud pollination and the use of self incompatibility, autopolyploidy, allopolyploidy and radiation-induced mutation being mentioned.

837 NEGI, L. S. & NIRMAL SINGH MAINI
**'B.S.G.'—a promising new strain of sarson (*Brassica campestris*) for the Punjab.**
Indian Oilseeds J. 1957 : **1** : 142–44.

BSG (Brown Sarson Gurgaon) has been built up by mass selection from samples collected in the Mewat region, Gurgaon, Punjab, at the Oilseeds Substation, Gurgaon. It matures at about the same time as the local strains and is uniform in habit and time of flowering. In addition to giving yields of up to 58% greater than the local strains, with an average increase of 33%, its oil content is 5·8% greater.

838 RAJAN, S. S. & AHUJA, Y. R.
**Seed development in colchicine-induced autotetraploids of toria.**
Indian J. Genet. 1956 : **16** : 63–76.

Diploids and induced autotetraploids of high and low fertility have been studied. The lack of fertilization of the normal embryo sacs appears to be the chief cause of sterility in the autotetraploids. Prefertilization abnormalities and abnormal development of embryo and endosperm also cause sterility. It is thought that genes control seed sterility in these autotetraploids.

839 Winterkoolzaad, 1957. (**Winter rape, 1957**).
Landbouwvoorlichting 14 : Bijl. 12; Ber. Rassenkeuze 1957 : No. 229 : unpaginated.

In trials of six varieties on different soil types in the Netherlands, the two new varieties Tetraploïde CB and Diamant [Diamond] equalled Lembkes in growth but were inferior in yield.

840 DHARAMPAL SINGH
**Xenia and possibility of its utilisation in oleiferous *Brassicae* for increasing yield.**
Indian Oilseeds J. 1957 : **1** : 152–54.

In a number of interspecific and intervarietal crosses made at Kanpur, Uttar Pradesh, among rape and mustard varieties, pollination by different male parents has been found to result in differences in pod and seed size. Pods twice the normal size were produced by *Brassica chinensis* after pollination by the toria variety 4104, but no increase occurred after pollination by toria A. A decrease in pod size was observed in a cross between a purple-leaved variety of *B. juncea* ♀ and *B. juncea* 'Creamrai' ♂. When four varieties of yellow toria were grown separately and as mixtures of two varieties the highest yield was obtained from the mixture of Maghi Lahi and ET 2/2–3 and it is concluded that at least part of this yield increase is due to the effect of xenia.

841 KOZŁOWSKI, J. & NOWIŃSKI, M.
Doświadczenia odmianowe z rącznikiem. (**Varietal trials of the castor oil plant**).
Biul. Inst. Roślin leczn. 1957 : **3** : 107–14.

Of the four varieties, Plewiska, Puławy, Borowska and N6, tested during 1954–56, the first two gave the highest yields while N6 was distinguished by resistance to shattering.

842 **New castorbean variety.**
What's New Crops Soils 1957 : **9** : No. 8 : p. 27.

Dawn, a new dwarf variety of castor oil plant, has been jointly released by the USDA and the Texas Agricultural Experiment Station. It is adapted to irrigated areas in Texas where machine harvesting is carried out and produces shattering-resistant seeds which hull easily. It is resistant to lodging, wind damage and *Alternaria* leaf spot and tolerant of bacterial leaf spot.

843 PARKEY, W.
**Cytoplasmic influence in the production of the pistillate sex expression in castorbeans.**
Agron. J. 1957 : **49** : 427–28.

Evidence for both cytoplasmic and genetical control of the pistillate condition in castor oil plants has been found in back and sib crosses of line 1–4, which is pistillate, to lines 1–8, 1–10 and 1–7 at Oklahoma Agricultural Experiment Station. When back crossed for three successive generations to the first two of these lines only pistillate progeny were produced although both lines gave normal progeny when selfed. Segregation was observed in the first back cross progeny of 1–4 x 1–7, two of the pistillate progeny giving only pistillate plants on back crossing while two others gave progeny segregating in the ratio 3 pistillate : 1 normal. The combined operation of a single gene pair and maternal cytoplasm is postulated to account for these results. Crosses of line 1–4 with other lines gave largely normal progeny, indicating that most lines act as restorers of normal sex expression. [Cf. XX, 1829].

844 SESHADRI, C. R.
**Future of oilseeds research—*Sesamum.***
Indian Oilseeds J. 1957 : **1** : 96–98.

Work carried out so far and aims and future prospects for the breeding of *Sesamum* in India are briefly discussed.

845 MARTIN, J. A. & CRAWFORD, J. H.
**Palmetto sesame. A new non-shattering variety.**
Circ. SC agric. Exp. Sta. 1955 : No. 98 : Pp. 8.

**New Palmetto sesame released by station.**
S. Carol. agric. Res. 1955 : **2** : No. 2 : unpaginated.

The substance of these papers has been summarized already [XXVI, 601].

846 **Sesame . . . old crop with new life.**
Agric. Res., Wash. 1957 : **5** : No. 12 : 4–5.

Rio [cf. XXVI, 602], Delco, Margo, Blanco and Dulce, improved varieties recently released in the USA, are mentioned. The first two are nonshattering and the last three shattering.

847 MAZZANI, B.
Clasificación de variantes en *Sesamum.* **(Classification of variants in *Sesamum*).**
Agron. trop., Venezuela 1957 : **6** : 195–201.

A list of characters found to be useful in classifying varieties of *Sesamum* spp. is presented. It is pointed out that the greatest range of variation occurs in East Africa and in India but that at least some of the species will cross with certain South American species such as *Martynia diandra.*

848 **Notes on sesame varieties from the Central Rainlands Research Station of the Republic of the Sudan, Ministry of Agriculture, 1956** : Pp. 8. (Mimeographed).

A large collection of local and introduced varieties has been studied at Tozi. They are compared with respect to their agronomic characters and resistance to bacterial leaf spot believed to be caused by *Pseudomonas sesami.*

849 NEGI, L. S.
**K2—an improved strain of linseed offers hope to the cultivators of Kangra Hills in the Punjab.**
Indian Oilseeds J. 1956 : **1** : 11–14.

This linseed strain, derived from a cross between a rust-resistant UP variety and an early maturing local strain, is superior to local Punjab strains in the following respects: its seeds are larger and have a higher oil content, it matures 10 to 12 days earlier and gives yields of three to over eight maunds per acre more, is more erect in habit, immune to rust and highly resistant to wilt. It is particularly well adapted to the Kangra Hills region but has also done well at two localities in the Punjab plains.

850 MATHUR, R. S., MATHUR, S. C. & LAL, S. B.
**Linseed rust in Kumaon Hills, Uttar Pradesh.**
Indian Oilseeds J. 1957 : **1** : 145–47.

Tabulated data are included on the reaction of 22 linseed varieties artificially inoculated at Chaubattia, Uttar Pradesh, with a mixed inoculum of nine rust samples from four localities in India. Only 5% of the plants of NP21, from the Indian Agricultural Research Institute, and 10% of 475 from Uttar Pradesh were affected under the conditions of the test. At Jeolikote 13 varieties were tested under natural infection and 477–3/2 remained uninfected while Banaras 2, Type 1, Bahraich local, Mirzapur and 1193–1 showed only traces of infection.

851 MERH, J. L. & KULKARNI, S. N.
**Problem of wilt and rust on linseed in Madhya Bharat.**
Indian Oilseeds J. 1957 : **1** : 105–07.

A total of 170 linseed strains from all parts of India have been tested for their reaction to all races of *Melampsora lini* at the Institute of Plant Industry, Indore, since 1953 and 107 have been found to be resistant. Of 200 strains tested between 1953 and 1955 for resistance to *Fusarium oxysporum* f. *lini*, 21 were found to be resistant to both wilt and rust and in the following year some of the progeny from these varieties showed greater resistance than the original samples. Several are promising in respect of other characters such as yield, oil content and earliness. Preliminary tests of isolates of *F. oxysporum* f. *lini* from various localities in Madhya Bharat show that they could be classified into six groups according to their cultural characters and pathogenicity to five linseed varieties from different parts of India.

852 BONNET, P. & VIDAL, P.
Les abrasins en Guinée forestière. (**Tung in the forest zone of Guinea**).
J. Agric. trop. Bot. appl. 1957 : **4** : 53–68.

*Aleurites montana* was introduced into French Guinea in 1940. Lines with a high yield of oil have been isolated and have been successfully propagated by grafting. Techniques for grafting and artificial pollination are described.

853 WATARI, S.
**A large silicified wood of *Aleurites* from the Miocene of Isikawa Prefecture, Honsyu.**
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1956 : **69** : 468–73.

A description is given of a sample of fossil wood of Miocene date. It is identified as a species of *Aleurites* closely related to *A. cordata* and *A. fordii*; it is named *A. miocenica.*

854 PUTT, E. D.
**The sunflower : breeding program in Manitoba.**
Agric. Inst. Rev. 1957 : **12** : No. 3 : 13–15, 18.

Progress in sunflower breeding since 1937 is reviewed. Current work includes the production of hybrid seed, the development of synthetic varieties, the production of early-maturing hybrids and breeding for rust resistance.

855 BOEV, N. D.
(**Promising sunflower varieties for the Urals, Siberia and Kazahstan).**
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1957 : No. 2 : 40–44. [Russian].

Mention is made of new varieties as well adapted to cultivation in the above mentioned regions as the standard Saratov 169 but surpassing this in oil yield per unit area. The best among them are Armavir 9343, Armavir 9345 and VNIIMK 8883 [Institute of Oil Plants 8883]. All these show resistance to *Orobanche* and have an oil content upwards of 39·1% as against the 34% of Saratov 169.

856 ARGIKAR, G. P., MORBAD, I. R. & THOBBI, V. V.
**The range of variation and correlation of some quantitative characters in *Carthamus tinctorius* L.**
Indian Oilseeds J. 1957 : **1** : 228–34.

Data are given for 15 quantitative characters in 26 Bombay varieties of safflower. It was found that the girth of the stem, the spread of the plant, the number of fruiting branches and the number of capitula are highly correlated with yield. Observations of these characters may facilitate field selection.

Comptes Rendus de la Conférence Franco-Britannique sur le Palmier à Huile, 15–25 Janvier 1956. (**Report of the Franco-British Conference on the Oil Palm, 15-25 January, 1956**).
Bull. agron. Fr. d'out. mer 1957 : No. **14** : Pp. 206.

857 *Hartley, C. W. S. Oil palm breeding and selection.* (*pp. 31–36*).

The history of oil palm breeding in Nigeria is reviewed. Inheritance of fruit characters is being studied in *dura* x *tenera* crosses. The influence of different parental forms is being studied in *dura* x *pisifera* crosses. Work on selection for yield and oil content is described.

858 *Broekmans, A. F. M. Studies on the controlled pollination of the oil palm.* (*pp. 37–41*).

Studies on the technique of pollination at the West African Institute of Oil Palm Research are described [cf. XXIV, 558].

859 *Gascon, J. P. & Prevot, P. Orientation de la sélection du palmier à huile à l'I.R.H.O.* (*Orientation of oil-palm breeding at the Research Institute for Oils and Oil-crops*). (*pp. 42–47*).

Oil-palm breeding in French West Africa is reviewed. Numerous introductions from the Belgian Congo and Malaya were made in 1948. Selection and crossing of *dura* x *tenera* and *dura* x *pisifera* forms are in progress at La Mé, Pobé, Dabou and Sibiti. One line has produced 3305 tons of palm oil per ha. at La Mé.

860 *Gascon, J. P. Étude sur les* pisifera *et les croisements* dura *x* pisifera. (*Study on* pisifera *forms and* dura *x* pisifera *crosses*). (*pp. 48–58*).

A description is given of the various types of sterility and semisterility encountered in *pisifera* palms. Three series of *dura* x *pisifera* crosses are promising: (1) some material from Yangambi, (2) crosses from Pobé adapted to dry conditions, and (3) Deli *dura* from Dabou x *pisifera* from Yangambi.

861 *Pichel, R. L'amélioration du palmier à huile au Congo belge.* (*The improvement of the oil palm in the Belgian Congo*). (*pp. 59–66*).

Oil-palm breeding since 1922 is shortly reviewed. Emphasis is laid on *dura* x *pisifera* crosses with high oil yields. $F_2$ progenies are being studied to estimate the combining ability of selected $F_1$ mother trees. Natural palm groves and plantations are being surveyed for promising parents. Preliminary inbreeding studies have been made with the object of obtaining heterotic hybrids.

862 *Broekmans, A. F. M. Factors influencing the periodicity of growth and flowering in the oil palm.* (*pp. 163–72*).

In the course of this paper, evidence is provided of the value of breeding oil palms for a high sex-ratio if forms adapted to dry areas are required. Data are given on the performance of the high sex-ratio strain 551.256 and two low sex-ratio strains under wet and dry conditions in West Africa.

863 *Fremond, Y. Recherches agronomiques de l'I.R.H.O. sur le cocotier.* (*Agronomic research by the Institute for Research on Oils and Oil-crops on the coconut*). (*pp. 204–06*).

Preliminary work on pollination methods in French West Africa is reported.

864 PICHEL, R. J.
Quelques aspects de la culture du palmier à huile et du cocotier en A.O.F. Conférence franco-britannique sur le Palmier Elaéis et le Cocotier à Cotonou et à Abidjan, Janvier 1956. (**Some aspects of oil-palm and coconut cultivation in French West Africa. A Franco-British conference on oil palm and coconut at Cotonou and Abidjan, Jan. 1956**) 1957 : Pp. 96.

[Cf. 857–63].

865 PRONK, F.
Is kunstmatige bestuiving bij oliepalm van invloed op de productie? (**Does artificial pollination of oil palm affect yield ?**)
Bergcultures 1957 : **26** : 317–19.

At the experimental station of the General Association of the Rubber Planters of the East Coast of Sumatra, no significant increase in yield was shown by 19 *dura* palms pollinated artificially about three times a year during 1950–56, as compared with 21 unpollinated controls.

866 SUNDARA RACHAVAN, R.
**Chromosome numbers in Indian medicinal plants.**
Proc. Indian Acad. Sci. 1957 : **45** : 294–98.

The following numbers are reported for the first time: *Phyllanthus niruri*, $2n = 26$; *Toddalia asiatica*, $2n = 72$; *Rauwolfia serpentina*, $2n = 22$; *R. densiflora*, $2n = 44$; *R. canescens*, $2n = 66$; *Calotropis procera*, *C. gigantea*, *Hemidesmus indicus*, $2n = 22$; and *Andrographis paniculata*, $n = 25$. In the case of five species, numbers differing from those previously reported were obtained: *Emblica officinalis*, $2n = 98$; *Cissus quadrangularis*, $2n = 24$; *Aegle marmelos*, $2n = 18$; *Cuscuta reflexa*, $n = 16$; and *Curculigo orchioides*, $2n = 18$. Counts in the remaining six species investigated agreed with those made by previous workers.

867 WERMANN, H.
Über die pharmakologische Auswertung tetraploiden Materials von *Digitalis purpurea* and *Digitalis lanata* am Meerschweinchen. (**On the pharmacological evaluation of tetraploid material of *D. purpurea* and *D. lanata* on the guinea pig**).
Pharmazie 1955 : **10** : 327–31.

In addition to showing morphological differences from $2n$ forms, $4n$ forms of the above species yielded a less toxic alcoholic drug extract than that obtained from $2n$ plants. The difference is attributed to the higher water content of the $4n$ plants.

868 Spencer, J. L. & Winters, H. F.
**Compatibility, pollination, and disease in relation to fruit yields of *Strophanthus intermedius* in Puerto Rico.**
Bot. Gaz. 1957 : **118** : 194–98.

An artificial-pollination experiment revealed that *S. intermedius* is highly self incompatible. The floral structure renders natural self pollination unlikely. Suitable insect vectors are probably not present in Puerto Rico.

869 d'Angremond, A.
**Seed gardens.**
Arch. Rubb. Cult. 1957 : **34** : 55–95.

This posthumous article was drafted during World War II. The merits of seed gardens of rubber consisting of two, three or more clones are discussed, preference being given to the polyclonal type. From an analysis of yield data from progeny tests, it is concluded that a garden consisting of clones AV152, AV163, AV308, AV321, A374, Pil B84 and either AV161 or its close relative AV317 is likely to give the best results in eastern Sumatra.

870 Collado Montes, M. & Rafols, W. de
Selección del *Taraxacum kok-saghyz* (Rodin). [**Selection of *T. kok-saghyz* (Rodin)**].
An. Inst. nac. Invest. agron., Madr. 1957 : **6** : 21–34.

In a population grown from seed obtained from the Swedish Plant Breeding Institute, Svalöf, the mean rubber content of the roots was 18·47% but values of more than 30% were also found. Distribution curves are given showing the rubber contents of plants with five different leaf types, from entire to deeply lobed, plants with various numbers of roots, plants which flowered during their first year, those which withered and those which produced supernumerary rosettes. Plants with fairly deeply lobed leaves (type 4) had a relatively high modal rubber content of 18·85% and there was a tendency for rubber content to increase with increasing root number.

## FRUITS AND NUTS

871 Gleisberg, W.
Baumschulforschung. (**Tree-nursery research**).
Gartenbauwiss. 1957 : **22** : 3–25.

The developments in Germany over the last fifty years are reviewed in four sections, (1) rhythm of development, (2) stock-scion relationships, (3) tree breeding and (4) cold resistance. Under breeding, reference is made to the work on breeding fruit trees and their rootstocks at the Kaiser-Wilhelm Institut in the prewar and the Max-Planck Institut in postwar years. This has included breeding rootstocks for apples, pears and plums by crossing with wild species of *Malus* and *Pyrus* and of *Prunus cerasifera* and *P. insititia*; selection of apples for resistance to *Venturia inaequalis* by crossing with Antonovka and Ernst Bosch; and the production of a number of pear varieties resistant to *Venturia pirina*, seedlings of sour cherries resistant to *Sclerotinia cinerea* and gooseberries resistant to *Sphacelotheca mors-uvae*. A whole complex of properties characteristic of certain apple varieties may be inherited together and can be combined with single characters from other forms; in this way a Cox with larger fruits has been produced and others have greater winter hardiness or earlier ripening. Apples with improved keeping capacity or winter hardiness have been obtained from crosses with Ontario, and other varieties that transmit frost resistance are Danziger Kantapfel [Danzig Kant apple], Schöner von Nordhausen [Nordhausen Beauty], Croncels, Weisser Klarapfel and the Antonovka group.

A plea is made for greater international cooperation in studying problems of breeding fruit and forest trees and rootstocks.

872 Murawski, H.
Wissenschaftliche Grundlagen der Weiterentwicklung der Obstzüchtung. (**Scientific bases of the further development of fruit breeding**).
Dtsch. Gartenbau. 1957 : **4** : 131–33.

The transmission of features such as the fruit colour and flavour of Cox's Orange Pippin and of resistance to frost and scab in apples and mildew in gooseberries are named among the successful achievements of breeding by hybridization. The more extensive use of irradiation for the induction of mutation, the artificial production of allopolyploid combinations and the study of developmental physiology in connexion with breeding climatically adapted varieties are recommended.

873 Oppenheimer, C.
**Report on study tour on subtropical fruit growing and research to India and Ceylon, March 1952 - September 1952.**
Spec. Bull. agric. Res. Sta. Rehovot, Israel 1956 : No. 3 : Pp. 60. (Mimeographed).

The author summarizes and discusses some current breeding work in the above countries, with special reference to its application for Israeli horticulture.

874 Bolonjanov, A.
**(The achievements in Far-eastern horticulture).**
Kolhoz. Proizvod. (Collect. Fm. Prod.) 1957 : No. 9 : 41–42. [Russian].

Mention is made of apple, pear, plum, black currant and vine varieties, with fruit of fair or good quality and hardy under the conditions of the Soviet Far East. The new apples include hybrids of Reinettes with nonhardy large-fruited varieties and among the black currants is a hybrid between a wild local form and a European variety. The hybrid currant is very hardy, gives high regular yields and ripens early.

875 Zwintzscher, M.
Beiträge zur Vererbung des Frostverhaltens der Obstgehölze. I. Die Reaktion von Kreuzungsnachkommenschaften des Apfels, der Birne, Pflaume und Kirsche auf den Barfrost im Februar 1954. **(Contributions to the inheritance of frost reaction in fruit trees. I. The reaction of progenies of crosses of apple, pear, plum and cherry to the snow-free frost in February 1954).**
Gartenbauwiss. 1957 : **22** : 50–70.

The results of observations of 3373 apple, 366 pear, 58 plum, 430 cherry and 18 pear x almond seedlings after the frosts of 1954 where temperatures of — 20° C. were prolonged, are presented. Seedlings of Cox tended to be susceptible, even when the other parent was a variety which normally gives hardy seedlings, such as Antonovka, Danzig Kant or Macoun: one Cox seedling however gave a number of hardy individuals in a cross with Antonovka. Some crosses of Antonovka with other hardy varieties produced a number of susceptible seedlings, so it cannot be said that hardiness is dominant. Occasionally resistant seedlings appeared in crosses of two susceptible parents. Very few resistant seedlings occurred in crosses of Ontario, Jonathan, Red Victoria or Gravenstein. A number of hardy seedlings were found in back crosses of hybrids of *Malus micromalus* and *M. zumi*, especially when the back-cross parent was Antonovka.

Among the pears, seedlings from Le Lectier, Williams and Congress were mostly susceptible but some hardy seedlings were obtained from Robert de Neufville and from crosses of Clapp's Favourite x Nouvelle Poiteau, though both these last-named varieties are themselves susceptible; the pear Hohensathen from East Prussia also gave some hardy seedlings.

The Schattenmorelle [Morello] cherry gave a very high proportion of hardy seedlings, 92·9% in controlled selfings and 92·3% from open pollination. Clone 10, a seedling of Schattenmorelle x Rote Mai [Red May] gave similar figures.

All but one of 18 peach x almond seedlings were damaged, although the peach parent was hardy. Of 58 seedlings of *Prunus insititia* 'Myrobalana alba' x *P. spinosa* only 23 survived.

No marked difference in the behaviour of reciprocal crosses was observed in these crosses. The author stresses the fact that hardy seedlings can be produced from cultivated varieties without crossing with wild species; the proportion of hardy seedlings should be determined only by diallel crossing as it is not necessarily related to the reaction of the parents. No grounds were found for assuming the existence of two kinds of hardiness.

876 Peterson, R.
**Better fruit for South Dakota.**
S. Dak. Fm. Home Res. 1957 : **8** : No. **3** : 16–21.

A summary is given of the fruit breeding done in South Dakota in the past 70 years; this work has been mainly concerned with the following crops: apple, pear, apricot, plum, cherry and grape. Current work is briefly discussed; the emphasis is on breeding for hardiness.

877 Nybom, N.
Äppel, päppel . . . . **(Apple, papple . . . .)**
Fruktodlaren 1957 : **28** : 115–22.

After giving examples of fertile interspecific and intergeneric hybrids, both natural and artificial, resulting from crossing followed by chromosome doubling, the author briefly describes current work on pear x apple hybrids (papples) in Sweden. So far, a few seedlings have been obtained from pollinating a tetraploid form of the pear Fertility with the Balsgård tetraploid apple type BM2812 from the variety Ribston. In addition, polyploids of other apples and pears and of quince and *Chaenomeles* have been developed with a view to effecting further crosses among pome fruits.

878 Boone, D. M. & Keitt, G. W.
***Venturia inaequalis* (Cke.) Wint. XII. Genes controlling pathogenicity of wild-type lines.**
Phytopathology 1957 : **47** : 403–09.

One or more of seven pairs of genes in *V.*

*inaequalis* controlled pathogenicity to one or more of the 15 apple varieties studied [cf. XXVII, 3403]. The different gene pairs respectively determined pathogenicity to the following varieties: (1) McIntosh, Yellow Transparent and Hibernal, (2) Haralson, Wealthy, Prairie Spy, Beacon, Rome Beauty and Northwestern Greening, (3) Red Astrachan and Yellow Transparent, (4) Haralson, Hyslop and Yellow Transparent, (5) Hyslop, (6) Grimes Golden and (7) Prairie Spy. Each pair consisted of an allele conditioning flecks and another responsible for lesions; in those cases in which gene pairs at different loci controlled pathogenicity to the same variety, the alleles for flecking were epistatic to those for lesions. Pairs 1, 2, 3 and 4 were at separate and independent loci. The remaining pairs also are tentatively considered to be at different loci but genetic proof is not yet complete. Locus 4 was approximately 13 cross-over units from the centromere; all the other loci appeared to be 33 or more units from their respective centromeres.

879 BUDAGOVSKIJ, V. I.
**(The origin of dwarfing rootstocks of the apple).**
Bot. Ž. (Bot. J.), Moskva 1957 : **42** : 211–29. [Russian].

Descriptions are given of Transcaucasian dwarf apple varieties which possess the characteristics of such common rootstocks as Paradise VIII and IX and Dusin II and V; it is thought that all these stocks originated from Transcaucasia. Some of the Transcaucasian varieties are regarded as valuable breeding material.

880 MAGNESS, J. R. & DERMEN, H.
**An internal polyploid sport of Winesap apple.**
Proc. Amer. Soc. hort. Sci. 1957 : **69** : 65–67.

A giant sport of Winesap consisted of a $2n$ epidermis and $4n$ internal tissue [cf. XXVII, 4355]. Seeds obtained from the sport, probably as the result of pollination by $2n$ Delicious, gave rise to triploids, tetraploids and aneuploids. The tetraploids may have originated through apomixis.

881 AVENT, K. L.
**Some apple rootstocks and potassium.**
J. Aust. Inst. agric. Sci. 1957 : **23** : 154–57.

A series of rootstock varieties, mostly of the Malling-Merton series, was investigated. The varieties showed wide differences in susceptibility to potassium deficiency in the soil.

882 THIELE, I.
Progressive Frostversuche mit keimenden und einjährigen Kernobst-sämlingen.
**(Progressive frost experiments with germinating and one-year-old pome-fruit seedlings).**
Züchter 1957 : **27** : 161–72.

Observations were made on 237,000 seedlings of apple and pear in the years 1953–56. Studies were made of the time of germination in different varieties and crosses; seeds at various stages of germination were kept overnight at 3° C. and then subjected to — 4·5° C. for one hour; after thawing at 10–12° C. they were planted and compared with the controls. Those that produced seedlings with primary roots were classed as resistant and those without primary roots but with secondary roots as partially resistant. The proportion of seedlings in the resistant class was less when the seeds were treated in the later stages, after the primary root had passed the length of 2 mm. Various environmental factors that affected the reaction are mentioned. There was no correlation between rate of germination and resistance.

The results showed that the apples Borsdorf Kitajka [Borsdorf Crab], Kleiner Langstiel [Small Long-stalked] and W. Wintertaffet were the most resistant and Cox one of the most susceptible; most pears were susceptible. In some cases the rating of the seedlings corresponded with the known frost reaction of the variety; not so however in Grahams and Northern Spy apples and the pear Gellerts Beurré, which gave susceptible seedlings but are themselves hardy, and the apple Zuccamaglio, which is susceptible but gave hardy seedlings. Little or no effect on the hardiness of the seedlings was exerted by the pollinating variety and the reaction of the seedling corresponded entirely to that of the seed parent. The seedlings were allowed to grow through the summer, stored during the winter and tested again in January of the following year. The correspondence between the two sets of results was good in the apple varieties Cox and W. Wintertaffet but not in others: Kleiner Langstiel and Borsdorf Kitajka were less resistant in the one-year plants than in the seedlings, Grahams and Wildling von Einsiedel [Einsiedel Wilding] more. This result may be connected with the fact that the seedling reaction corresponded to that of the seed parent whereas in the later developmental stages the reaction is conditioned by the hereditary contributions of both seed and pollen parents. The reaction of dessert varieties of apples and pears was roughly equal at this stage; in cider and perry varieties the pears were hardier.

883 MÜLLER, G. F. W.
**Morphology, biology and control of the hawthorn spider mite *Tetranychus viennensis* Zacher (*Acari, Tetranychidae*).**
Höfchen-Brief. Bayer PflSch.-Nachricht. 1957 : **10** : 1–60.

The mite was found to prefer the apple variety Bohnapfel [Wax apple], to Goldparmäne [Golden Pearmain], Thüringer Winterrambour and Transparent. Bohnapfel has less hair on the leaves than the other varieties, which may account for its heavier infestation.

884 **WSC announces release of two new apricots.**
Bett. Fruit 1957 : **52** : No. 2 : p. 5.

The first of these two varieties, both of which are suitable for canning, was selected at the Irrigation Experiment Station, Prosser, Wash., from open-pollinated Riland seedlings and has been named Earliril. It is early flowering, consequently requiring protection from frost, and must be cross pollinated. The fruit is of medium size, freestone, and with a higher soluble solid content and lower acid content than Wenatchee. It ripens about a week earlier than Riland.

The second variety, Blenril, was selected from Blenheim x Riland and produces medium size fruit similar in appearance and quality to that of Blenheim but with higher soluble solid and acid contents.

885 PLOCK, H.
Probleme der Marillenkultur. (**Problems of apricot cultivation**).
Mitt. Klosterneuburg 1957 : **7** : 249–54.

Some varieties of *Prunus armeniaca* are recommended for testing as rootstocks; these varieties are briefly described.

886 GADZIEV, T. JU.
(**The choice of pollinators for new plum varieties under the conditions of the Voronež province**).
Agrobiologija (Agrobiology) 1957 : No. 1 : 120–23. [Russian].

The results of self and cross fertility studies of some Soviet varieties at Voronež are reported and good pollinators for each variety are listed. The self-fertile varieties included Sestra Zari [Dawn's Sister] and Gigant [Giant], which were obtained by interspecific hybridization involving self-sterile *Prunus ussuriensis* and unspecified Burbank varieties, also self-sterile.

887 STOLLE, G.
Das unterschiedliche Dickenwachstum der Veredlungspartner als Kriterium für die Auslese bei *Prunus mahaleb* L. als Sämlingsunterlage für Schattenmorellen. (**Differences in growth in thickness of the scion as a criterion for selection in *P. mahaleb* as a seedling rootstock for Morello cherries**).
Gartenbauwiss. 1957 : **22** : 81–86.

Observations on a number of Morello cherries grafted on *P. mahaleb* showed that in the majority of cases the stock grew more vigorously than the scion, which led to swelling at the union and various signs of disharmony. A search for cases in which this was not so revealed none in which the growth of the two partners was not correlated but in some the correlation was well below the average; these forms were characterized by vigorous growth of the stock without a pronounced difference in growth rate between stock and scion. Cuttings were taken of the rootstocks in such combinations in the hope of producing stocks of higher compatibility with Morello cherry scions.

888 FUNK, T.
Anfangsergebnisse bei der Selektion vegetativ vermehrbarer *Prunus mahaleb*- und *Prunus avium*-Formen. (**Preliminary results of selection of vegetatively reproduced forms of *P. mahaleb* and *P. avium***).
Gartenbauwiss. 1957 : **22** : 87–89.

Some 200 new clones of *P. mahaleb* capable of being reproduced vegetatively have been selected from seedlings and some of them show signs of being useful as rootstocks. In *P. avium*, cuttings were taken from trees with suckers and 17 of the 22 tested have proved capable of forming clones; six others have been produced from seedlings; they all withstood temperatures of — 27° C. during the 1955–56 winter.

889 SHARPE, R. H.
**Okinawa peach resists root-knot nematodes.**
Sunshine St. agric. Res. Rep. 1957 : **2** : No. 1 : p. 18.

A peach rootstock imported into Florida from Okinawa has been found to be immune to *Meloidogyne incognita* and *M. incognita* var. *acrita* and highly resistant to *M. javanica* and in this respect it is superior to all other strains available in Florida. It is also immune to the burrowing nematode, *Radopholus similis*, and has proved superior as a rootstock when budded with Jewel. It flowers between Red Ceylon and

Jewel and the small, sweet fruits ripen about a week later than Jewel. It has already been used in crosses with Georgia.

890 Cohen, A.
**The effect of different factors on the ascorbic acid content in citrus fruits. II. The relationship between species and the ascorbic acid content of the juice.**
Bull. Res. Counc. Israel : Sect. D : 1956 : **5** : 181–88.

Tabulated data are provided showing the ascorbic acid content of the juice of fruits of 29 varieties of orange, nine of grapefruit, three of lemon, 17 of mandarin and four hybrids between mandarin varieties or between mandarin and orange examined at Ramat Gan, Israel. Considerable variation between varieties was noted in each species but closely related varieties showed very similar ascorbic acid contents. A study of Eureka lemons grafted on to sweet lime or rough lemon rootstocks showed small but consistent differences not only between trees on the two rootstocks but also between trees from budwood of three different provenances. Examination of individual fruits on a tree of Shamouti orange revealed a sudden change in the ascorbic acid contents of fruit about the middle of a branch, frequently associated with an increase in the number of seeds and a change of shape in some of the fruits. It is suggested that these observations may be explained by assuming a reverse bud mutation to Baladi [Local] since it is thought that Shamouti originated by bud mutation from Baladi.

891 Hely, P. C.
**Control of the citrus bud mite.**
Agric. Gaz. NSW 1957 : **68** : 240–43, 262.

This review mentions that Valencia oranges are much less susceptible to *Aceria sheldoni* than Naval oranges, and the lemon variety Lisbon is more resistant than Eureka. Most mandarin varieties are not affected.

892 Resnik, M. E.
Influencia de hormonas vegetales sobre la germinación del polen de los citrus. (**The influence of plant hormones on the germination of citrus pollen**).
Bull. Res. Counc. Israel : Sect. D. : 1956 : **5D** : 223–24.

Germination of pollen of the Meyer lemon in a 15% sucrose solution at 20° C was increased by the addition of 2-4D, thiamin, boric acid or indolebutyric acid.

893 Petrov, I. A.
K pokusnému pestovaniu citrónovníkov a pomarančovníkových kultúr na Slovensku. (**Experiments on the cultivation of lemon and orange fruits in Slovakia**).
Biológia, Bratislava 1956 : **11** : 731–35.

Mention is made of two new spineless forms of lemon and one of orange from Bratislava.

894 Grant, T. J. & Higgins, R. P.
**Occurrence of mixtures of tristeza virus strains in citrus.**
Phytopathology 1957 : **47** : 272–76.

Differences in pathogenicity have been observed at Orlando, Florida, between isolates of the above virus when tested on Key limes. It is suggested either that the virus mutates readily or that it exists as a mixture of strains producing different symptoms. The presence of more than one strain in one host plant is thought to be related to the failure of any strain to become systemic, thus leaving parts of the host tree available for the development of strains.

**Proceedings of the Eleventh Annual Research Conference of the California Fig Institute, Fresno, California, January 31, 1957** : Pp. 51.

895 *Fisher, C. D. Color life of fig varieties. (p. 6).*

The colour-retentive properties of pastes made from new fig varieties were investigated. Variety 70–62 was found outstanding in this respect.

896 *Warner, R. M. New fig varieties which escape vinegar fly damage. (pp. 6–8).*

Field trials have shown that Conadria 143–5 is much less attractive to *Drosophila* and less prone to sour than Adriatic. 70–62 was found to give a large first crop and an earlier main crop than Adriatic and Kadota; 70–74 gives an unusually early and heavy first crop. An early Calimyrna form has been discovered which is more resistant to splitting than the normal Calimyrna. A Smyrna type, 184–15, is mentioned for its excellent flavour and appearance and complete resistance to splitting.

897 Barrau, J.
L'arbre à pain en Océanie. (**The bread-fruit tree in Oceania**).
J. Agric. trop. Bot. appl. 1957 : **4** : 117–23.

A general account is presented, which includes a discussion of origin and history, and local names for the species and its varieties.

898 BRAZZIGHER, G.
Über Anfälligkeit und Resistenz verschiedener Wirte von *Endothia parasitica*. **(On susceptibility and resistance of different hosts of *E. parasitica*).**
Phytopath. Z. 1957 : **30** : 17–30.

Infection of *Castanea sativa* with *E. parasitica* resulted in the development of cork or callus tissue, neither of which formed an effective barrier against the spread of the fungus. Tyloses were also formed, apparently as a result of toxin production by the parasite. In *Fagus sylvatica*, which is resistant, the cork layer formed inhibited further fungal growth. The observation that *E. parasitica* was heterotrophic for a substance occurring in chestnut bark extract as well as in yeast extract suggested that resistance may be associated with differences in concentration of the substance. Treatment of the normally resistant species *C. mollissima* with respiratory inhibitors decreased its resistance. This species also appeared to be unusually susceptible in the cold winter of 1956.

899 JONES, D. F.
**Breeding better trees.**
Frontiers Pl. Sci., Conn. 1957 : **9** : No. 2 : p. 6.

The breeding of chestnuts for blight resistance is briefly summarized.

900 **Review of results of research from schemes financed by the Indian Central Oilseeds Committee.**
Indian Oilseeds J. 1957 : **1** : 163–80.

Tabulated data are included on the yield in nine-year trials and shelling percentages and oil and free fatty-acid percentages of six spreading groundnut varieties, seven early bunch types, four bold bunch types, three late bunch types and three late vigorous types tested at the Hebbal Agricultural Farm, Bangalore.

901 PELERENTS, C.
L'arachide à Yangambi. **(The groundnut in Yangambi).**
Bull. INÉAC 1957 : **6** : 243–55.

The methods used in current breeding work are described. Four good-quality varieties, bred at Yangambi, are compared. A20 was found to give the highest yield.

902 HIGGINS, B. B.
Rapports de la sélection et des variétés avec la qualité des arachides en vue d'usages déterminés. **(The relations of selection and varieties with the quality of groundnuts for specific purposes).**
Oléagineux 1957 : **12** : 411–15.

In this review of work on the relationship between the chemical composition of the kernel and oil on the one hand and botanical characteristics on the other, it is shown that the kernels of varieties with the sequential type of branching [cf. XXVI, 2796] contain oils with a higher proportion of linoleic glycerides than those of alternately branched varieties and have a slightly higher content of lipids and proteins. A high content of linoleic acid is associated with a greater tendency to become rancid but is nevertheless regarded as a nutritionally desirable character and therefore as a breeding objective. The relations between chemical composition and suitability for the salted peanuts and peanut butter trades are discussed.

903 EICHHORN, E.
Nouvelle contribution à l'étude caryologique des palmiers. **(A new contribution to the caryological study of the palms).**
Rev. Cytol., Paris 1957 : **18** : 131–51.

Chromosome numbers are reported and the appearance of the nucleus during mitosis and interphase described for species pertaining to 31 genera. Interphase nuclear structure, and in particular the appearance of the chromocentre, is highly variable and the different types observed do not correspond with taxonomic categories.

904 **Annual Report of the Coconut Research Board of the Coconut Research Institute for 1955.**
Ceylon 1957 : Pp. 70.

Although dwarf palms have the advantage of small size and earliness of flowering, their use is not recommended since those under observation at the Ratmalagana Estate since 1940 have shown several disadvantages including drought susceptibility, biennial bearing, small nut size and low yields of good copra.

A seed garden planted to selected hand-pollinated nuts has been started in an isolated area in the Ambakelle forest reserve. Preliminary observations on some $F_1$ progeny of Ceylon *typica* x Dwarf indicate that they are vigorous, flower early and bear nuts of a satisfactory size. Further hybridization was carried out during 1955.

905 LIYANAGE, D. V.
**Report of the Botanist, [Coconut Research Institute of Ceylon].**
Ceylon Cocon. Quart. 1956 : **7** : 44–48.

Of the intervarietal hybrids studied [cf. 886] $F_1$ Ceylonese *typica* x Dwarf shows particular promise as regards vigour, early age of flowering and size of nut. Induction of polyploids in *typica* and dwarf palms by colchicine is being attempted. Significant differences were detected between families in period taken for germination and in seedling characters.

906 Ciaravellini, L.
Olivi nel piano-colle della Maremma Grossetana. **(Olives of the plains and hills of the Maremma of Grosseto).**
Frutticoltura, Bologna 1957 : **19** : 245–57.

The characteristics are described of the three types of olive, Moraiolo, Correggiolo and Leccino, grown in this part of Italy.

907 Baldini, E.
Contributo allo studio delle cultivar toscane di olivo. Indagini condotte in provincia di Pistoia. Parte I. **(A contribution to the study of the olive cultivars of Tuscany. Investigations conducted in the province of Pistoia. I.).**
Ann. Sper. agr. 1957 : **11** : No. 4 : Suppl. : cxlv–clxx.

Following work already summarized [XXIV, 617 and 1432] the author here describes briefly the distribution and possible origins of the 22 varieties grown in the above region. Data are provided on the percentage of abortion of the ovaries and the percentage fruit set of these varieties and information is included on their self and cross compatibility, the best pollinators for each variety being noted.

908 Evreinoff, V. A.
Contribution à l'étude du grenadier. **(A contribution to the study of the pomegranate).**
J. Agric. trop. Bot. appl. 1957 : **4** : 124–38.

An account is presented of the biology, origin, distribution and cultivation of the pomegranate. Numerous cultivated varieties from all over the world are described and classified according to the sugar and acid content of the fruit.

909 Banerji, I. & Pal, S.
**A note on the cytology and pollen of *Aegle marmelos* Corr.**
Phyton 1957 : **8** : 75–78.

*Ae. marmelos* was found to have $2n = 18$ and to be meiotically normal. Morphological details of the chromosomes are given.

910 Popenoe, W.
Las distintas variedades de paltos. **(The different varieties of avocado).**
Campesino, Santiago 1957 : **89** : 23–26.

The Mexican, Guatemala and Antilles races are distinguished, though their identification is complicated by the existence of a number of hybrids, one of these being the variety Fuerte; this and a number of other varieties are described.

911 Ebeling, W. & Pence, R. J.
**Orange tortrix on avocados.**
Calif. Agric. 1957 : **11** : No. 8 : 13–14.

Observations in California indicated that McArthur and Hass are less susceptible to *Argyrotaenia citrana* than Fuerte.

912 Jinno, T.
**(Studies on Rubus hybrids. I. On *R. trifidus* ♀ x *R. hirsutus* ♂).**
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1955 : **68** : 164–69. [Japanese].

A morphological and cytological description is given of the above hybrid, a vigorous, apparently heterotic, plant. The modal meiotic configuration is $6_{II} + 2_{I}$. The seeds are sterile.

913 Jinno, T.
**(Studies on Rubus hybrids. II. On *R. trifidus* ♀ x *R. ribisoides* ♂).**
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1955 : **68** : 221–25. [Japanese].

The hybrid is intermediate morphologically between the parents; the peduncles are erect at first as in *R. trifidus* but droop later as in *R. ribisoides*. The modal meiotic configuration is $6_{II} + 2_{I}$; 45% of the pollen grains have cell contents while 55% are empty [cf. 912].

914 Jinno, T.
**(Studies on Rubus hybrids. III. On *R. trifidus* ♀ x *R. palmatoides* ♂).**
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1955 : **68** : 323–26. [Japanese].

A morphological and cytological description is given of the above moderately fertile hybrid. Meiosis is regular though in 1–2 bivalents pairing may be loose.

915 Lilly, P. L.
**A taxonomic study of the genus *Rubus* in Pennsylvania.**
Diss. Abstr. 1957 : **17** : Publ. No. 20,964 : 957–58. (Abst.).

A monograph of the native and naturalized species of *Rubus* in Pennsylvania has been prepared. Apomicts and agamic complexes were found to be common and hybrids are persisting successfully in the wild, many of them including species introduced for their fruit. A total of 34 species and two varieties are recognized, two of the species being described for the first time.

916 **Raspberries and blackberries.**
Publ. Canad. Dep. Agric. 1957 : No. 836 : Pp. 11.

Well established varieties of raspberry and recent introductions to Canada are described with special reference to quality.

917 Scott, D. H. & Ink, D. P.
**Treatment of *Rubus* seeds prior to after-ripening to improve germination.**
Proc. Amer. Soc. hort. Sci. 1957 : **69** : 261–67.

In connexion with breeding, treatments of seeds of raspberry and blackberry prior to after-ripening were studied at Beltsville, Md. Improvements in germination were obtained by soaking the seeds in 1% NaOCl solution for 1–2 weeks, or scarifying with concentrated $H_2SO_4$. Keeping the seeds moist at 70–75° F. for 7 or 8 weeks before subjecting them to after-ripening at 36° F. for 3–5 months improved germination in some seed lots.

Selections of blackberry differed widely in germination capacity when germinated by a single method. The selections differed in the percentage of aborted seeds among apparently normal seeds, but no correlation was detected between germination and percentage of aborted seeds.

918 Hill, A. R.
**Observations on the reproductive behaviour of *Amphorophora rubi* (Kalt.), with special reference to the phenomenon of insect resistance in raspberries.**
Bull. ent. Res. 1957 : **48** : 467–76.

Sixteen varieties of *Rubus* were tested. The following were highly resistant to *A. rubi*: *R. lambertianus*, *R. strigosus*, *R. idaeus* x *R. fruticosus* and two varieties of *R. idaeus*, Malling Landmark and 64/2. *R. idaeus* 'Newburgh' was fairly resistant.

The use of aphid-resistant varieties to reduce virus spread is briefly discussed.

919 Scott, D. H., Darrow, G. M. & Ink, D. P.
**Merton Thornless as a parent in breeding thornless blackberries.**
Proc. Amer. Soc. hort. Sci. 1957 : **69** : 268–77.

The thornless character of Merton Thornless (4*x*) was inherited as a single recessive in crosses with the hardy variety Eldorado (4*x*) and moderately hardy Brainerd (4*x*) at Beltsville, Md. Significant deviations from expected ratios were however obtained when certain seedlings were used as ♀ parents to produce $F_2$ or back-cross progenies; these seedlings apparently contained a factor lethal to about half the ♀ gametes giving rise to thornless seedlings. In selection of $F_2$ and back-cross progenies, vigour presented less of a problem than winter killing and sterility. Of the 1397 thornless seedlings grown in the field in 1952 and 1953, 37 have been selected for use in breeding or testing as possible commercial varieties. Twenty-three of the 37 have been rated as winter hardy at Beltsville; thornless selections with much greater hardiness than Merton Thornless are therefore now available.

920 Mosolova, A. V.
**(New varieties of currant from the Institute of Plant Industry).**
Bjull. vsesojuzn. Inst. Rasten. (Bull. All-Un. Inst. Pl.-Industr.) 1956 : No. 2 : 37–38. [Russian].

Five new varieties of black currant and one of red currant are described. The black currant Neosypajuščajasja [Nonshedding], from Oval'naja [Oval] x Neapolitan, is hardy, early and free from anthracnose and the berries, which ripen together, stay on the bush without losing their quality. Izbrannaja [Elect], from Lija Plodorodnaja [Prolific Lija] x Zelenoplodnaja [Green-fruited], has berries with a high sugar content, is hardy and resistant to anthracnose but fruits periodically. Saharanaja [Sugary], from Lija Plodorodnaja x Slava Leningrada [Glory of Leningrad], has high contents of vitamins and sugars and is frost resistant.

The red currant Ščedraja [Profuse], from Fejja Plodorodnaja [Prolific Fejja] x Haughton Castle, is resistant to anthracnose, hardy and productive.

921 Garretsen, F. & Kronenberg, H. G.
Opbrengstproeven met zwarte bessen. **(Yield trials of black currants).**
Meded. Dir. Tuinb. 1957 : **20** : 424–32.

Results of trials of commercial varieties, carried out over several years at eight stations in the Netherlands, are surveyed and the effects of locality, weather, disease and variety upon yield are discussed. It is suggested that trials must continue for at least four or five cropping years before susceptibility to spring frosts can be determined satisfactorily. On the basis of variability in yield of individual varieties, the numbers of bushes per variety required for a trial to have a 50% or 75% chance of showing significant intervarietal yield differences of various magnitudes are calculated.

922 Bauer, R.

**The induction of vegetative mutations in *Ribes nigrum*.**

Hereditas, Lund 1957 : **43** : 323–37.

In investigations at the Max-Planck Institute for Breeding Research, Germany, hardwood cuttings in a condition of physiological activity were exposed to 3000 r. of X rays. Sports were isolated by (1) rooting portions of the primary shoots, (2) rooting the sports found among the lateral shoots arising from the decapitated cuttings and, in addition, portions of the apparently normal lateral shoots, and (3) allowing the stool bases to regenerate. Plants obtained by (1) and (3) were repeatedly cut back in order to secure further shoots for selection.

Considerable varietal differences were found in the frequency of sports. Three groups were distinguished: "large" mutants in which the normal type was altered in many respects; "small" mutants changed in a few characteristics of the leaf and shoot; and "uncertain" mutants differing from the controls only by giving a higher yield. Sports in the first group were usually sterile. Mutants of the second group occurred with the highest frequency; they were fertile when crossed but their capacity for self fertilization appeared to be disturbed. The frequency of sports combining two or more improvements with practical significance was very low. This method of obtaining variation is however regarded as having a number of advantages over selection of hybrids.

923 Mosolova, A. V.

**(New varieties of gooseberry bred by the Institute of Plant Industry).**

Bjull. vsesojuzn. Inst. Rasten. (Bull. All-Un. Inst. Pl.-Industr.) 1956 : No. 2 : 39–40. [Russian].

Eight new varieties, most of them produced by interspecific crossing, are described. The first three seedlings are from Industria x *Grossularia arcuata*. Isabella is resistant to frost and mildew and the fruit is suitable for processing. Doškol'nik [Preschooler] is fully resistant to mildew and productive, the fruit being suitable for dessert. Višnevyj [Cherry] has cherry-coloured fruits. Černyš [Darky], from Lancer x *G. divaricata*, bears good crops of almost black berries suitable for processing. Otličnik [Excellent], from Goliath x Joceline, bears large berries. Solnečnyj [Sunny], from Henning's Early x Venera, is early and suitable for dessert. Urožajnyj [Productive], a seedling from Belyj Plodorodnyj [White Prolific], can be reproduced by cuttings and is suitable for processing. Lučistyj [Radiant], from Henning's Early x Venera, is early and suitable for dessert. All the varieties are resistant to frost and *Sphaerotheca mors-uvae*.

924 Darrow, G. M., Scott, D. H. & Hough, L. F.

**A new blueberry introduced—Blueray.**

Bull. NJ agric. Exp. Sta. 1956 : No. 783 : unpaginated.

Unlike Ivanhoe, Blueray [GM37 (Jersey x Pioneer) x CU5 (Stanley x June)] has been consistently productive in Michigan. It is easily propagated and produces large, firm, light-blue fruits with good flavour. It has the disadvantages of a tendency to overbear, a scar of the Coville type and tight clusters.

925 Way, R. D.

**Cultivated elderberries.**

Fm. Res. 1957 : **23** : No. 3 : p. 15.

This review mentions that breeding work is in progress at New York and Nova Scotia. Some new introductions are listed. All varieties appear to be self sterile.

926 Dijksterhuis, H. P.

Verslag van het aardbeirassenproefveld te Zeerijp over 1957. **(Report on the strawberry trial field at Zeerijp in 1957).**

Tuinbouwber., Groningen 1957 : **12** : 141–43.

Details of yield and quality are given for four early, three midearly, six midlate and three late varieties tested in 1957 at Zeerijp, Netherlands. The desirability of testing strawberries over more than one year is pointed out.

927 Katinskaja, Ju. K.

**(New varieties of strawberry bred at the Institute of Plant Industry).**

Bjull. vsesojuzn. Inst. Rasten. (Bull. All-Un. Inst. Pl.-Industr.) 1956 : No. 2 : 35–36. [Russian].

Descriptions are given of ten strawberry varieties bred by the Institute during the post-war period. One of them, Leningradskaja Pozdnjaja [Leningrad Late] is described as late in ripening, high in yield, resistant to *Botrytis cinerea* and hardy in the Leningrad area. It is a hybrid from Pobeditel' [Victor] x Saksonka [Saxon]. Another late variety, Pozdnjaja iz Pavlovska [Pavlovsk Late], from Späte von Leopoldshalle x Saksonka, is also hardy in the Leningrad area. All ten are good in yield and quality, the best in this latter respect being Persikovaja [Peach], from Čudo Ketena [Keten Wonder] x Koralka

[Coral]. Some of the varieties are suitable for processing.

928 **New strawberries.**
Amer. Nurserym. 1957 : **106** : No. 2 : 116–17.

Redglow, Surecrop and Earlidawn have recently been released in the USA. The first two varieties are red-core resistant. Redglow is early ripening and satisfactory for freezing. Surecrop is especially suitable for the fresh market. Earlidawn (Midland x Tennessee Shipper) is highly productive and very early in ripening; its flowers have short stalks and are therefore protected from frost.

929 JORDAN, C. & SENGBUSCH, R. v.
Veränderungen des Zuckergehaltes von Erdbeeren und Früchten anderer Beerenobstarten nach Lagerung bei tiefen Temperaturen. **(Alterations of the sugar content in strawberries and other soft-fruit species after storage at low temperatures).**
Züchter 1957 : **27** : 186–87.

Storage for about a year at − 15° to − 20° C. resulted in an almost complete loss of sucrose in most fruits, but the loss in the strawberry Senga Sengana was less than in Senga 29 and Senga 54; this suggests the possibility of breeding varieties that lose less sugar in cold storage.

930 EICHELSBACHER, H. M.
Ein genetisch-züchterischer Vergleich der Rebensorten Riesling, Silvaner und Müller-Thurgau. **(A comparison of the grape varieties Riesling, Silvaner and Müller-Thurgau from the standpoint of genetics and breeding).**
Gartenbauwiss. 1957 : **22** : 99–139.

The variety Müller-Thurgau has the property of transmitting its characteristics to its progeny, both in selfings and in crosses with other varieties. This fact, together with some correspondence of Müller-Thurgau that is cited, casts doubt on the supposed origin of the variety as a seedling of Riesling x Silvaner. A full phenotypic analysis of the leaf characters was undertaken and the results show that in leaf form both Müller-Thurgau and its selfs differed from Riesling and Silvaner in having more strongly lobed leaves, in the early ripening of the wood and the green colour of the shoot tips, for all of which characters Müller-Thurgau was homozygous for the dominant genes.

The variety Mainriesling, known to be a hybrid of Silvaner x Riesling, segregated normally for leaf lobing in its progeny, which is moreover intermediate in time of ripening of the wood and pubescence of the shoot tips, which are predominantly red or brown as in Riesling. Reciprocal crosses of Mainriesling x Müller-Thurgau differed markedly in their characters, showing that the characteristic features of Müller-Thurgau are partly dependent on cytoplasmic factors. In the $F_2$ of the cross with Müller-Thurgau as the ♀ the seedlings all had lobed leaves as in Müller-Thurgau whereas in the reciprocal there were 11·8–26·0% with unlobed leaves. Reciprocal crosses of Silvaner x Müller Thurgau and Müller-Thurgau x Riesling also showed similar differences; in both crosses the progeny from crosses in which Müller-Thurgau was the ♀ had a higher proportion of deeply-lobed leaves than the Müller-Thurgau selfs. The proportion of green shoot tips is also higher in the progenies where Müller-Thurgau served as ♀ and the proportion of pubescent shoot tips was lower.

From these results it is concluded that Müller-Thurgau is a distinct variety, with very special cytoplasmic potentialities, and not a hybrid of Riesling x Silvaner.

931 BLAHA, J.
Uvologická charakteristika Chrupky bílé a červené. **(Ampelographic descriptions of White and Red Chrupka).**
Sborn. čsl. Acad. zeměd. Věd : Řada rostlinná Výroba 1957 : **30** : 687–96.

Characteristics suitable for identification of the above varieties of dessert grapes from Czechoslovakia are presented.

932 DEL GAUDIO, S. & PANZERA, C.
"Negro Amaro." **(Bitter Negro).**
Ann. Sper. Agr. 1957 : **11** : No. 4 : xlix–xlvi.

The grape variety described here, of some importance in the province of Lecce, is used either separately or with Malvasia nera to make a red wine.

933 COSMO, I. & POLSINELLI, M.
**"Fortana."**
Ann. Sper. Agr. 1957 : **11** : No. 4 : clxxi–clxxxi.

The above variety is described; it produces blue-black grapes used only for making an inferior wine.

934 KOMAROVA, E. S.
**(Promising Georgian grape varieties for the Ukraine).**
Vinodelie Vinogradarstvo SSSR (Winemak. & Vitic. USSR) 1957 : No. 4 : 28–34.

Some of the local grape varieties of Georgia when grown in the Ukraine proved more resistant to mildew and had larger bunches and yields of 70–80 c. per ha. or more; others, however, failed to ripen. The most promising of the varieties are described.

935 STOCKMANS, F.
Au sujet de la présence de la vigne en Belgique au cours des périodes historiques et préhistoriques. **(On the subject of the existence of the vine in Belgium during historical and prehistorical times).**
Bull. Jard. bot. Brux. 1957 : **27** : 495–501.

A short history is given of vine cultivation in Belgium since the nineteenth century. The author has not found conclusive evidence for vine cultivation before the ninth century. The significance of plant remains attributed to *Vitis* sp., which have been found in Belgian peat deposits, is discussed. It is concluded that the vine in its wild state disappeared from Belgium in the first Pleistocene ice age.

936 RADLER, F.
Untersuchungen über den Gehalt der Moste einiger Rebensorten und -arten an den Vitaminen Pyridoxin, Pantothensäure, Nicotinsäure und Biotin. **(Investigations into the content of the vitamins pyridoxine, pantothenic acid, nicotinic acid and biotin in the must from some varieties and species of grape).**
Vitis 1957 : **1** : 96–108.
RADLER, F.
Der Vitamingehalt der Moste verschiedener Rebenarten und -sorten. **(The vitamin content of the musts of different grape species and varieties).**
Experientia 1957 : **13** : p. 318.

Data are provided on the content of pyridoxine, pantothenic acid, niacin and biotin in the must of a number of species and varieties of grape. The highest values for pyridoxine and pantothenic acid were found in *Vitis solonia* var. *robusta*, *V. riparia* and *V. cinerea* and in some crosses involving these species (Oberlin 595, C1202 and G26). Of the varieties tested, C1202 was found to have the highest nicotinic acid content. Biotin content was invariably low and interspecific differences in niacin content were slight.

937 WILLIAMS, C. F.
**Relation of berry size to flower type of seedlings in muscadine grape crosses.**
Proc. Amer. Soc. hort. Sci. 1957 : **69** : 254–60.

Pistillate seedlings had larger fruits than ☿ seedlings from the same cross, when vines equal in productivity or weight of good seeds per fruit were compared. The larger fruits of pistillate seedlings may be due to metaxenia or genetic linkage.

938 HAČATRJAN, S. S.
**(The inheritance of the character of early maturity in hybrid seedlings of the vine).**
Agrobiologija (Agrobiology) 1957 : No. 1 : 72–77. [Russian].

Breeding work on vines at Erevan involving northern and southern ecotypes with different growth periods is described. Productive and early-ripening forms with grapes of high quality were selected among hybrids of Sejanec Malengra [Malingre Seedling] with the early or midseason southern varieties Spitak Arakseni and Sev Sateni. These bore heavy bunches of large berries and their flavour was good. Hybrids of Sejanec Malengra with Muskat Rozovyj [Pink Muscat] bore berries with a strong muscat aroma.

939 PEYER, E.
Ergebnisse zehnjähriger Prüfungen von veredelten Reben auf verschiedenen amerikanischen Unterlagensorten. **(Results from ten year trials with vines grafted on to different American rootstocks).**
Landw. Jb. Schweiz 1957 : **71** : 373–415.

These trials took place in nine districts. The varieties Blauburgunder [Blue Burgundy] and Riesling x Sylvaner were grafted on to selections from Berlandieri x Riparia and on to Riparia x Rupestris 3309(C). Of the Berlandieri x Riparia selections, 8B (Wädenswil) was found to be most satisfactory on soils which tend to cause chloriosis. Clone 5C (Wädenswil) has also done well in comparison with other Berlandieri x Riparia selections; at Douanne it was found that scions grafted upon it were superior in quality and yield.

940 AFRIKJAN, B. L.
**(Biochemical descriptions of hybrid vine seedlings).**
(Biochemistry of Wine-making). Izdatel'stvo Akademii Nauk SSSR 1957 : 237–52. [Russian].

The biochemical characteristics of Sejanec Malengra [Malingre Seedling] x Čeljaki Krasnyj [Red Čeljaki] and other hybrids were investigated in Armenia and the results are discussed in relation to the morphological and biological variability noted among hybrid plants derived from the same parents.

941 CONSTANTINESCU, G., LĂZĂRESCU, V. & POENARU, I.
Criterii biologice pentru stabilirea momentului de înflorire la vița de vie (*Vitis vinifera sativa*). **[Biological criteria for establishing the moment of flowering of the vine (*V. vinifera sativa*)].**
Bul. ști. : Secț. Ști. agric. Șect. Geol. Geogr. 1956 : **8** : 827–46.

Details are provided on the flowering date, length of side shoot and number of leaves borne by it before inflorescence development, and heat and insolation requirements for inflorescence formation of numerous varieties cultivated in Rumania.

942 KOROBKINA, Z. V.
**(Transportability and keeping properties of some dessert grape varieties).**
Vinodelie Vinogradarstvo SSSR (Wine-mak. & Vitic. USSR) 1957 : No. 3 : 38–42. [Russian].

While several other varieties cultivated in Uzbekistan showed good transportability, only the following combined this characteristic with good keeping properties: Kišmiš Rozovyj [Pink Sultana], Iščaki, Karmannyj [Pocket], Italia and Karaburnu.

943 PREOBRAŽENSKIJ, A. A.
**(Biochemical characteristics and technological properties of the vine varieties cultivated in Central Asia).** (Biochemistry of Wine-making).
Izdatel'stvo Akademii Nauk SSSR 1957 : 213–36. [Russian].

Varieties cultivated in Central Asia are evaluated from the technological viewpoint. Many make high quality champagne and other wines.

944 VEGA, J.
Creación de la colección ampelográfica de la Facultad de Ciencias Agrarias. **(Creation of the vine collection of the Faculty of Agrarian Sciences).**
Rev. Fac. Cienc. agrar., Mendoza 1955 : **5** : 58–61.

The Argentine vine collection, comprising 699 varieties and said to be the largest in Latin America, contains 42 varieties thought to be of local origin.

945 GEISLER, G.
Untersuchungen zum Verhalten interspezifischer Vitis-Kreuzungen gegen Trockenheit. **(Investigations of the response to drought of interspecific *Vitis* crosses).**
Vitis 1957 : **1** : 82–92.

Tabulated data are provided on the resistance to drought of a number of crosses. The hybrid Vi107 x Vi2401 produced the greatest number of highly resistant types. The results are discussed with special reference to the breeding of rootstocks.

946 HOFMANN, E. L.
Untersuchungen über unterschiedliche Nodositätenbildung an der Wurzel verschiedener Rebensorten bei Reblausbefall und deren Bedeutung für die Resistenzzüchtung. **(Investigations into differences in nodosity formation caused by aphid attack on the roots of different varieties of grape and their significance in breeding for resistance).**
Vitis 1957 : **1** : 66–81.

It was found that the roots of *Vitis vinifera* varieties became nonfunctional after attack by *Viteus* (*Phylloxera*) *vitifolii*. American species and interspecific hybrids, including some *V. vinifera* crosses, were found to be tolerant of *V. vitifolii*. Tolerance appeared to be associated with vigorous root growth.

## FORESTRY

947 LANGNER, W.
Forstpflanzenzüchtung und Baumschule. **(Forest-tree breeding and tree nurseries).**
Gartenbauwiss. 1957 : **22** : 140–46.

Forest-tree breeding in Germany is briefly reviewed with special reference to the role played by the various forest-tree nurseries.

948 JABLOKOV, A. S.
**(The acclimatization of trees and shrubs by means of distant sexual hybridization).**
Izdatel'stvo Znanie, Moskva 1953 : Pp. 39. [Russian].

The uses of wide hybridization and pollen mixtures in breeding deciduous trees and conifers in the USSR are discussed, especially in relation to breeding hardy or otherwise valuable new forms of walnut, hazel, oak, poplar, birch, larch, *Sequoia* and pine. Some of the results have been previously reported [cf. XXV, 551–69], but the following supplementary information, mostly from Ivanteevka in the Moscow province and from Soči, is given.

**Walnut.** Forms productive of nuts and hardy under Moscow conditions were obtained by interspecific hybridization. Some of these are late flowering whereby they escape spring frosts. Other new forms resulted from back crossing of the various interspecific hybrids or from crossing these with yet other species, or even with *Carya olivaeformis* or *Carya alba*. Mention is made of fruiting intergeneric hybrids of *Juglans mandshurica* x *Pterocarya caucasica* and *J. mandshurica* x *P. stenoptera*.

**Hazel.** Barcelona and other varieties producing large nuts were fertilized by the pollen of hardy wild hazels from Moscow and the hybrid progenies raised under Moscow conditions. The hybrids combined the desired characters and bred true. Some valuable forms arose by natural or artificial hybridization involving the above newly bred forms.

**Poplar.** Hardy, quick-growing pyramidal forms moderate in soil requirements have been bred. Among the crosses which gave good results were *Populus alba* ♀ (originating from central Russia or the Ukraine) x *P. bolleana* ♂ (from Central Asia), *P. tremula* ♀ (north Russia) x *P. bolleana* ♂ (Central Asia) and *P. pyramydalis* ♀ (Russia or the Ukraine) x *P. nigra* ♂ (Baškiria).

**Birch.** *Betula verrucosa* x *B. ermani* and other interspecific hybrids from Moscow are characterized by quick growth, improved fruiting capacity and seed quality, especially with regard to viability. Some hybrids were obtained by multiparental fertilization.

**Conifers.** Wide hybridization, with the use of pollen mixtures, produced heterotic effects in *Larix* spp. and *Pinus sylvestris*. Quick-growing hybrids of *Sequoia gigantea* x *S. sempervirens* and intergeneric hybrids of *S. sempervirens* with other unspecified Taxodiaceae have been developed at Soči.

949 Sarvas, R.
Skogsskötsel och växtförädling. (**Forest management and plant breeding**).
Årsberätt. För. Växtf. Skogstr. 1956 (1957) : 16–22.

In this lecture delivered before the Swedish Association of Forest Tree Breeding in 1957, the chief topic discussed is the need for forms of softwood species which remain finely branched and free from large knots even when grown at wide planting distances such that thinning is not required in the early stages before the thinnings are of commercial value. Larches and spruces of this type have been developed at Punkaharja, Finland. It is suggested that close plantings, although affording greater genetic variability by virtue of the greater number of plants, are of less use in breeding for the above character than wide plantings, since the rapidly growing trees likely to be left after thinning closely planted stands are not necessarily those in which the finely branched character is best developed. Other Finnish breeding projects referred to are the development of pines suitable for replacing spruce in areas between 64° N. and 66° N., where resistance to snow damage is required, and work on the acclimatization of introduced races and species by appropriate intraspecific and interspecific crosses.

950 Årsberättelse över Föreningens för växtförädling av skogsträd verksamhet under 1956. (**Annual report on the work of the Association for Forest Tree Breeding in 1956**).
Årsberätt. För. Växtf. Skogstr. 1956 : 3–15.

**Hardwood trees.** At Ekebo, work on interspecific alder hybrids continued [cf. XXVI, 3792]. In view of the marked differences in growth and disease resistance between hybrid aspen families with different male and female parents, further crosses between *Populus tremuloides* and Swedish and Polish *P. tremula* have been effected with the aim of testing as many combinations as possible. Interspecific hybrids and hybrids between northern and southern Swedish aspens are being tested at Sundmo.

**Conifers.** Progenies from crosses between pines of different provenance are being tested at the Ekebo and Brunsberg stations. Further crosses of the type central Swedish x southern Swedish pines have been effected at Brunsberg and of the type northern x southern at Sundmo. At all three stations spruce progeny trials continued and crosses between different provenance types have been carried out. A group of crosses between continental and Värmland spruce at Brunsberg are distinguished by rapid growth. Interspecific crosses involving *Larix decidua*, *L. leptolepis*, *L. sibirica* and *L. gmelinii* have been effected.

951 Nilson, B.
Om sambandet mellan moderträd och avkomma hos tall och gran. (**On the correlation between mother tree and progeny in pine and spruce**).
Årsberätt. För. Växtf. Skogstr. 1956 : 52–65.

In progeny trials of open-pollinated pine and spruce at several localities in Sweden, tree height of the progenies was not closely related to volume of the mother trees ($r = -0{\cdot}10$) but showed a significant positive correlation with the ratio height/diameter (H/D) of the mother trees ($r = +0{\cdot}28$), the coefficient varying from $r = +0{\cdot}14$ to $r = +0{\cdot}56$ in different trials. It is shown that progeny height may justifiably be used in evaluating progeny productivity since (*a*) correlation coefficients almost identical with the above were obtained when volume instead of height of progeny was compared with mother-tree volume and H/D and (*b*) similar coefficients were found in comparisons of volumes of grafted trees with the parental values. Further estimates of progeny height at the age of 50 years, calculated on the basis of growth rate during the first ten years, showed a correlation of $r = +0{\cdot}61$ with height at ten years and a highly significant correlation of $r = +0{\cdot}56$ between height at ten years and volume at 80 years was obtained from data on trunks of felled trees. On the basis of the above results, it is suggested that the ratio H/D, which is an expression of both height and form of the tree, may prove a useful criterion for selection.

952 Exempel på skogsträdsförädlingens inriktning och metodik. (**Examples of the organization and methods of forest tree breeding**).
Skogen 1957 : **44** : 544–45.

Among the topics mentioned in this short general survey of forest tree breeding in Sweden are: selection, crossing, testing and multiplication of plus trees; hybridization for the purpose of combining the desirable characters of different parental trees; provenance trials; breeding for resistance to various disorders; induction and testing of mutants; and the possibility of breeding for desirable chemical properties of the wood.

953 Basse, N.
Årsberetning 1956–57. (**Annual report 1956-57**).
Hedeselsk. Tidsskr., Aarhus 1957 : **78** : 159–90.

The forest-tree breeding work of the Danish Heath Society has included progeny and provenance trials of Norway spruce, Sitka spruce and larch and selection and vegetative propagation of plus trees.

954 Robak, H.
Sambandet mellom daglengden og avslutningen av den årlige vekstperioden hos en del nåletreslag av interesse for vårt skogbruk. (**On the connexion between day length and termination of the annual growth period in seedlings of some conifers of interest to Norwegian forestry**).
Medd. Vestland. forstl. Forsøkssta. No. 31 : Pp. 62.

In Norway, exposure of *Picea abies*, *P. sitchensis*, *Abies grandis*, *Pseudotsuga taxifolia*, *Tsuga heterophylla* and *Larix decidua* from lower latitudes to 14-hour photoperiods accelerated terminal bud formation in autumn and generally increased winter survival as compared with the untreated controls. *Abies alba* from the Black Forest was unaffected either by long summer days or by short-day treatment.

955 Rohmeder, E.
Das Problem der Alterung langfristig vegetativ vermehrter Pappelklone. (**The problem of aging in poplar clones which have been vegetatively propagated for long periods**).
Forst-Wiss. Cbl. 1956 : **75** : 380–407.

Huse, S.
Degenerasjon ved klonformering. (**Degeneration through clonal propagation**).
Norsk Skogbruk. 1957 : **3** : 397–99.

After a general survey of literature on degeneration in aging plant clones, the results of observations on poplars in southern Germany are presented. The two oldest clones studied, *Populus serotina* and *P. marilandica*, the former having been vegetatively propagated for about 250 years and the latter for 150–180 years, were distinguished both by their high mortality rate in a plantation and in a varietal trial and by the smallness of the vein islets of the leaves. It was also shown that in *P. serotina* the rate of respiration was higher in relation to the rate of assimilation than in a young clone designated J214. In *P. canescens* a higher percentage of rooting was obtained in cuttings of juvenile material from suckers than in cuttings of adult forms from the crown of the tree. On the basis of these results and observations on grafting pines, which showed that scions from young clones gave a higher proportion of successful grafts than those from older clones, it is urged that more attention be paid to the production of new clones from crossed material.

The second paper is a Norwegian summary of the first.

956 JABLOKOV, A. S.
**(Pyramidal poplars).**
Goslesbumizdat-Moskva-Leningrad 1956: Pp. 57. [Russian].

The use of wide hybridization in developing hardy quick-growing forms in Moscow province is described [cf. 948]. Mention is made of further hybridization involving some material referred to in the earlier paper and also of new hybrids of *Populus alba* x *P. diversifolia* which show resistance to drought and salinity and are thought to be valuable for arid districts in south-eastern Russia.

957 CHIBA, O. & KOBAYASHI, T.
**(Some observations on the damage caused by diseases to nursery plants of poplar).**
Nihon Ringaku Kai Shi/J. Jap. For. Soc. 1957 : **39** : 74–78. [Japanese].

Information is provided on the clonal susceptibility of numerous species and hybrids to *Melampsora* spp., *Sphaceloma* spp., *Phyllosticta popularum* and *Mycosphaerella togashiana.*

958 SCHIPPER, M. A. A. & HEYBROEK, H. M.
Het toetsen van stammen van *Nectria cinnabarina* (Tode) Fr. op levende takken in vitro. [**Testing strains of *N. cinnabarina* (Tode) Fr. on living shoots *in vitro***].
Tijdschr. PlZiekt. 1957 : **63** : 192–94.

A number of elm hybrids resistant to Dutch elm disease proved to be susceptible to parasitic attack by virulent strains of *N. cinnabarina.* By culture *in vitro* on sterilized living twigs of elm and *Acer*, virulent strains able to kill the twigs rapidly could be distinguished from non-virulent strains and are being selected for use in testing elm hybrids for resistance.

959 BARBER, H. N. & JACKSON, W. D.
**Natural selection in action in *Eucalyptus*.**
Nature, Lond. 1957 : **179** : 1267–69.

Glaucousness in populations of *E. urnigera* from Mount Wellington in Tasmania was subjected to clinal analysis by measuring the frequency of nonglaucous and glaucous adult trees in the forest and also among seedlings raised from open-pollinated mother trees from different altitudes within the range of 1900–3500 ft. [cf. XXV, 3448]. Of the 67 mother trees chosen, 29 segregated for the glaucous and nonglaucous conditions, evidence of outcrossing thus being provided. The clines obtained for both seedlings and adult trees indicated that at the lower altitudes glaucous seedlings are eliminated by natural selection while at the higher altitudes nonglaucous seedlings are eliminated; the selective coefficients showed almost the maximum possible change in value over less than a 1500 ft. change in altitude. The progeny studies further indicated that several genes controlling intensity and pattern of glaucousness were segregating along the cline. Clinal variability was also noted in leaf shape, stem smoothness and time of the onset of dormancy in the progeny studies. The authors discuss the significance of the results in relation to general theories of evolution. It is pointed out that Wright's concepts do not allow for large selective coefficients. It is further suggested that cases of complex patterns of variability which have been interpreted by Anderson and others as cases of introgression may equally well be the result of selection alone and would probably have been more satisfactorily studied by the methods of clinal analysis. Mayr's view that speciation depends upon prior geographical separation of two or more populations is criticized for failing to take into consideration the situation in which contiguous populations are subjected to intensive selection in different directions, a gene or genes being lethal in one population but essential for the survival of the other. In such a situation, correlated adaptive changes would be gradually built up, the likelihood of the origin of a genetic barrier to crossing between the populations thus being enhanced. Finally, it is suggested that explanation of variability on the basis of introgression has wrongly deflected attention away from an attempt to interpret the functional nature of genetic variability.

960 ZINNAI, I.
**(Frequency of occurrence of polyploid plants of *Cryptomeria japonica* in the nursery).**
Nihon Ringaku Kai Shi/J. Jap. For. Soc. 1955 : **37** : 513–14. [Japanese].

Figures are given for the numbers of polyploids observed in forest nurseries of the above species.

961 CHIBA, S.
**(Selection of individuals resistant to *Cercospora cryptomeriae*).**
Nihon Ringaku Kai Shi/J. Jap. For. Soc. 1955 : **37** : 510–12. [Japanese].

Some progress has been made in breeding *Cryptomeria japonica* for resistance to the above disease by selecting under conditions of natural infection in the nursery.

962 Johnsson, H.
Några data från försökskulturer med nordamerikansk tall. (**Some data on test cultures of North American pines**).
Årsberätt. För. Växtf. Skogstr. 1956 : 23–36.

Of six North American pine species tested at four stations in Sweden, *Pinus monticola* and *P. resinosa* failed entirely, *P. strobus* grew poorly, *P. banksiana* did rather better than Swedish pines in the south but suffered snow damage in the north, *P. contorta* proved superior to Swedish pines in growth and was of good form in all except the northernmost station, and *P. ponderosa* var. *latifolia* grew relatively well in the south. In both *P. contorta* and *P. ponderosa*, the best types came from British Columbia.

963 Slabaugh, P. E. & Rudolf, P. O.
**The influence of seed source on the development of Scotch pine and Norway spruce planted in lower Michigan (fifteen-year results).**
Pap. Mich. Acad. Sci. 1957 : **42** : 41–52.

Plantations of Scots pine from ten and Norway spruce from 12 seed sources in Europe have been examined after 15 years and highly significant differences in height observed in both cases between trees of different provenance. Less significant differences have been observed in respect of insect and drought injury.

964 Mergen, F. & Novotny, H. M.
**Squash technique for chromosome studies in pine needles and root tips of slash pine.**
For. Sci. 1957 : **3** : 56–60.

A technique involving pretreatment in 1% colchicine for 1 hr. in bright sunlight or artificial light of 900 ft. candles, fixation in acetic alcohol and staining with crystal violet gave good results with *Pinus elliottii*.

965 Kiellander, C. L.
En beaktansvärd granproveniens. (**A noteworthy spruce provenance**).
Årsberätt. För. Växtf. Skogstr. 1956 : 37–51.

This paper has been summarized from another source [XXVII, 2317].

966 Kiellander, C. L.
Förbandet och rasen. (**Planting distance and race**).
Skogen 1957 : **44** : 578, 581.

The heritability of branching type and quality is exemplified by a spruce stand in Skåne, Sweden, in which trees of one race planted at a distance of 1·5 m. were finely branched and yielded wood of good quality while trees of another planted at 1·2 m. were coarsely branched and poor in quality, showing that these characters cannot be controlled entirely by close planting.

967 Irgens-Moller, H.
**Ecotypic response to temperature and photoperiod in Douglas-fir.**
For. Sci. 1957 : **3** : 79–83.

In investigations on seedlings of *Pseudotsuga menziesii* collected in Oregon, plants from high altitudes showed a photoperiodic response in date of bud bursting. The magnitude of this response increased if the seedlings were exposed to low night temperatures. A limited experiment suggested that the photoperiodic reaction may be nullified by high temperature during both night and day. It is suggested that natural selection at high altitudes may have favoured trees for which the optimum length of day for bud bursting occurs at a time when the likelihood of night frost is usually reduced.

## VEGETABLES

968 **New vegetable varieties. List IV.**
Proc. Amer. Soc. hort. Sci. 1957 : **69** : 574–87.

A further descriptive list is given of varieties of vegetables introduced into North America since 1936 by official institutions, trade organizations and private individuals [cf. XXVII, 2328].

969 Friend, J.
**Vegetable quality.**
Nature, Lond. 1957 : **180** : 174–75.

An account is given of the Second International Colloquium on Vegetable Quality, held in the Conservatoire des Arts et Métiers, Paris, during April 1957. The Colloquium was organized under the auspices of the Confoederatio Internationalis ad Qualitates Plantarum Edulium Perquirendos. Forty-eight papers, dealing mainly with the biochemistry of nutritional quality, were presented. The contributions included two papers by W. Schuphan on the analysis of essential aminoacids in *Brassica* and the influence of genetical factors on aminoacid composition within this genus, and a paper on the biosynthesis of carotenoids by G. Mackinney, who referred *inter alia* to "extended genetical studies in tomatoes [which suggest] that the Porter-Lincoln series is not operative, but that the aliphatic and alicyclic carotenoids are formed in parallel from the same common precursor".

970 Tokumasu, S.
**(Histological studies on pollen degeneration in male-sterile radishes).**
Ikushugaku Zasshi/Jap. J. Breeding 1957 : **6** : 249–54. [Japanese].

A detailed anatomical study of anther development in a male-sterile Japanese radish is presented. The proximate cause of anther degeneration appears to be failure of tapetum differentiation.

971 Sečkarev, B. I. & Kiričenko, L. I.
**(Utilizing initial material of carrots for breeding).**
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1957 : **31** : No. 2 : 226–33. [Russian].

Indications are given of those lines in the Leningrad collection thought suitable as parents in breeding for the following objectives: high quality, keeping capacity, early maturity, and suitability for forcing, canning, drying and forage. Some of the local forms from Soviet Central Asia and Asiatic countries are promising on account of their climatic adaptability, drought and heat resistance, yielding ability, succulence and high sugar or carotene content; some are tolerant of excessive humidity, and others have a very small core.

972 Patil, J. A., Chavan, V. M. & Patil, A. K.
**Effect of inbreeding on bulb yield and other agronomic characters in onion.**
Indian J. Genet. 1956 : **16** : 134–37.

It was found that inbreeding caused a loss of vigour but led to improvement in storage quality and more uniformity in size, shape and colour of the bulbs.

973 Plaisted, R. L., Horner, T. W. & Lana, E. P.
**Design and analysis of onion storage trials.**
Proc. Amer. Soc. hort. Sci. 1957 : **69** : 412–20.

Plaisted, R. L.
**Design and analysis of onion storage trials.**
Iowa St. Coll. J. Sci. 1957 : **31** : 499–500. (Abst.).

Suitable experimental designs for onion storage trials were investigated. It was found that significant variety x location and variety x length of storage interactions occurred and it is therefore not possible to recommend sub-optimum storage conditions or short-term storage data in studying varietal differences in keeping quality. Transformation of the percentage data to arc sines reduced the heterogeneity and nonadditivity of the variances.

974 Koncevoj, M. G.
**(Biological peculiarities of the Mjačkovskij onion and some problems connected with breeding it).**
Izv. Timirjazev. sel'skohozjajstv. Akad. (News Timirjazev agric. Acad.) 1957 : No. 1 : 20–30. [Russian].

The onion described, which takes its name from the village of Mjačkovo, is mixed in respect of both biological and morphological characters; certain similarities between it and the Kaba onions of the Rostov on Don region are pointed out and it is suggested that the variety in question arose at Mjačkovo from material introduced from Rostov, which later crossed freely with the local onions of the Mjačkovo district. In recent years it has tended to deteriorate, losing its flattened form and fine flavour, and breeding work to restore these qualities has been started. Material collected from Mjačkovo and the vicinity was grown at Moscow in normal and in short days. Examination of this material during development showed that the Mjačkovo and Kaba onions formed 9–10 leaves on the main stem before growth stopped in August whereas the common northern onions formed only 7–8; the leaves were also larger in the Mjačkovo and Kaba onions. The chlorophyll content was higher and the weight of a single plant was 136 and 178 g. compared with 102–104 g. in the common onions; the weights of bulbs were 95 and 123 g. compared with 78 g. The Mjačkovo onion ripened 6–8 days later than the common onion and 8–10 days before Kaba. The sugar content of Mjačkovo was 11·47% and the proportion of sucrose to monosaccharides was over 10 : 1 as in the common onions, whereas in Kaba it was less than 2 : 1. Growing in a 10-hour day increased the plant weight by 140% in common onions, 37% in Mjačkovo and 5% in Kaba and the bulb weight by 43·3%, 18·9% and 3·4% respectively. The length of the vernalization phase in the Mjačkovo onions was longer than in Kaba and approached that of the common northern varieties; they do not bolt in the Moscow region and the bulbs do not sprout during storage, although the loss during storage was greater. Of the various types found, those with flattened bulbs, yellowish pink in colour, are the best, being earlier and better in yield; these and the forms with only 1–3 flowering shoots are being selected.

975 Kazakov, A. A.
**(Influence of length of day on different species of onion).**
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1957 : **31** : No. 2 : 122–30. [Russian].

Reducing the day length to 8 or 12 hr. increased the number of leaves and reduced the bulb development in *Allium cepa* but had no effect on time of flowering. In *A. sativum* short day increased leaf formation and delayed flowering by up to 25 days and in *A. porrum* an 8 hr. day increased branching and reduced flowering and seed production.

976 Jones, S. T. & Kehr, A. E.
**The cytology and plant characteristics of an amphidiploid derived from *Allium ascalonicum* x *A. fistulosum*.**
Amer. J. Bot. 1957 : **44** : 523–29.

The above amphidiploid was obtained by treatment of the sterile $F_1$ hybrid with colchicine at Beltsville, Md., but the study reported here was carried out at Louisiana State University. The amphidiploid was more vigorous than the parent species and the $F_1$ hybrid, growing more rapidly and attaining a larger size but not forming bulbs. It was highly resistant to *Pyrenochaeta terrestris*. The percentage of stainable pollen produced ranged from 24·2 to 78·0 with an average of 64·3% as compared with 63·6% in *A. ascalonicum* and 88·6% in *A. fistulosum*. The first back cross to *A. ascalonicum* showed an average fertility of 15·1%. Meiosis in the amphidiploid was fairly normal, no unpaired segments being observed at pachytene and no multivalents at diplotene or later. The usual number of bivalents at metaphase I was 16, more than eight of which often showed random chiasmata while localized chiasmata were never shown by more than eight. It is suggested that this is due to some pairing between chromosomes from the parental species. Further support for this suggestion is adduced from the fact that some amphidiploid lines produced both bulb-forming and perennial lines in back crosses to *A. ascalonicum* and that both the amphidiploid and $BC_1$ plants varied greatly in their fertility.

977 Håkansson, A. & Levan, A.
**Endo-duplicational meiosis in *Allium odorum*.**
Hereditas, Lund 1957 : **43** : 179–200.

Observations on pairing during ♂ meiosis suggested that the diplosporous apomictic species *A. odorum* ($2n = 32$) arose as an autotetraploid, numerous structural changes subsequently affecting the chromosomes. In ♀ meiosis $32_{\text{II}}$ were formed, endomitotic duplication of the chromosomes having taken place before zygotene. The term autobivalent is proposed for this type of bivalent. Such a mode of compensating for lack of fertilization has so far not been discovered in any other flowering plant.

978 Sharma, A. K. & Bhattacharyya, B.
**Cytology of six species of *Asparagus* and *Lilium*.**
Phyton 1957 : **8** : 1–12.

The following somatic chromosome numbers were found: 20 for *A. racemosus*, *A. plumosus* and *A. nanus* and 60 for *A. sprengeri*. The number of secondary constrictions was six, two, four and ten respectively. Some variation was found in the chromosome counts for somatic nuclei of the same individual.

979 Wellensiek, S. J. & Jonkers, H.
Effect van selectie van zeer jonge aspergeplanten. **(Effect of selecting very young asparagus plants).**
Meded. Dir. Tuinb. 1957 : **20** : 506–11.

Selection for vigour may be effected by cutting 6 to 8-week old plants down to 1 cm. above the ground and selecting the 5% that regenerate most vigorously [cf. XX, 1203]. Male plants are selected by transferring the plants to a heated greenhouse in October so that they flower from the end of December and may be planted out in spring. By means of these methods, four plots were established containing, respectively, unselected plants, plants selected for the male character only, plants selected for vigour alone and plants selected for both vigour and male flowers. Selection for maleness gave a highly significant increase in yield of 35·2% in weight and 37·6% in number of stems over a period of four years. Selection for vigour resulted in nonsignificant increases of 9·6% and 10·4% in weight and stem number. A negative interaction observed between the effect of selection for both maleness and vigour and the effect of selection for maleness alone was not significant.

980 Fedotova, O. S.
**(Characteristics of the specific and varietal diversity of cabbages in resistance to club root).**
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1957 : **31** : No. 2 : 197–209. [Russian].

Studies were made on a large collection of forms belonging to the cabbage group, comparing them with the susceptible cabbage Nomer Pervyj Gribovskij 147 [Gribovo Number One 147] as control. None of the forms tested proved immune, with the possible exception of *Brassica napus* var. *pabularia* 'Schnitt grüner' [Green Cutting] from Germany; the most resistant were the Mediterranean cabbages, particularly *B. subspontanea*, and a number of curly and marrow-stem kales; the cabbages of northern Russia were more resistant than those of central Russia and central Europe, the best in this respect being Val'vat'evskaja Hibinskaja 220 [Hibiny Val'vat'evskaja 220] and Ladožskaja OS–8395; the most resistant in the central Russian group were Kubyška and Moskovskaja Pozdnjaja 15 [Moscow Late 15]. A great number of varieties proved less susceptible than the control. No resistant forms were found among the Savoy cabbages, Brussels sprouts, cauliflowers or kohl rabi but among the Brussels sprouts Herkules 1342 was the least susceptible and among the cauliflowers Leningrad 126 and Otečestvennaja [Fatherland]. *B. pekinensis* and *B. carinata* both proved highly susceptible.

981 Kole, A. P. & Philipsen, P. J. J.
Fysiologische specialisatie bij *Plasmodiophora brassicae* Woron. (**Physiological specialization in *P. brassicae* Woron**).
Tijdschr. PlZiekt. 1956 : **62** : 261–65.

When grown on soils inoculated with *P. brassicae* isolated from (*a*) cabbage or (*b*) turnip, cabbage was heavily infected by pathogen (*a*) and lightly by pathogen (*b*) while the reverse was true of turnip, indicating that two races of the fungus exist. Cauliflower was heavily infected by both isolates, slightly more so by (*a*).

982 Čereeva, S. N. & Gončarik, M. N.
(**The question of form development in the cabbage**).
Agrobiologija (Agrobiology) 1957 : No. 1 : 78–83. [Russian].

The occurrence of abnormal forms of Nomer Pervyj [Number One], grown under subarctic conditions, is discussed in relation to the time of transplanting and the temperatures at and immediately after vernalization [cf. XXV, 2446].

983 Walker, J. C., Larsen, R. H. & Pound, G. S.
**Badger Ballhead, a new cabbage resistant to yellows and mosaic.**
Phytopathology 1957 : **47** : 269–71.

This variety has already been described from another source [cf. XXVI, 2890].

984 Degry, H.
Massaselectie van bloemkolen. (**Mass selection of cauliflower**).
Tuinbouwber., Groningen 1957 : **21** : p. 141.

Studies carried out at Antwerp, Belgium, have shown that among the desirable characters to be taken into account in practising mass selection are: well-developed outer leaves protecting the head from too much sunlight; a short stalk rendering the plant less likely to be blown over by the wind; and a firm white curd with a fine structure, the latter being associated with resistance to bolting.

985 Jenkinson, J. G. & Campbell, W.
**Scorch of winter cauliflower.**
Plant Path. 1957 : **6** : 92–94.

Evidence is presented showing that scorch is an inherited character, the incidence of which is affected by the level of inorganic nitrogen manuring. Differences have been found both between and within varieties in the degree of scorch shown and it is suggested that a number of genes may be involved.

986 Huyskes, J. A.
Praktijkproeven met witlof 1954–1955. (**Field trials of Witloof chicory, 1954–1955**).
Meded. Dir. Tuinb. 1957 : **20** : 378–85.

Of 122 samples tested in the Netherlands, 33 received recommendation. On the basis of morphological and physiological characters, these fell into four groups for which the following names are proposed: Vroege Mechelse [Early Mechlin], suitable for early and in many cases midseason forcing; Middelvroeg Witlof [Midseason Witloof], for midseason and often late forcing; Late Witlof [Late Witloof], chiefly for late forcing; and Meilof [May Leaf], recommended for very late forcing.

987 Bohn, G. W. & Davis, G. N.
**Earliness in $F_1$ hybrid muskmelons and their parent varieties.**
Hilgardia 1957 : **26** : 453–71.

Differences have been found at Brawley and Davis, Calif., between nine varieties in respect of time of maturity. In all cases date of planting considerably affected rate of development but some varieties were early flowering and slow ripening while others were later flowering but faster ripening. Of the $F_1$ hybrids between early and late varieties three were significantly earlier than the averages of their parents, one was significantly later than the average and two significantly earlier than their early parents. Responses ranging from no dominance to apparent heterosis were observed for early flowering, slow ripening and short total growth period. The $F_1$ hybrid PMR5 x Kelly Sweet exhibited apparent heterosis for early maturity without showing heterosis for early flowering or early ripening and it is suggested that such apparent heterosis may have resulted from dominance interactions rather than from heterozygosity.

988 BALAŠOV, T. N.
**(Influence of the type of pistillate flowers in melons on the set of fruit).**
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1957 : **31** : No. 2 : 189–90. [Russian].

Pollination of pure female flowers in 1954 gave an average set of 22·6%, whereas hermaphrodite flowers or female flowers with rudimentary stamens gave a set of only 14·5%. In 1955 the respective figures were 60·6% and 28·2%.

989 CONROY, R. J.
***Fusarium* wilt of rockmelon (*Cucumis melo* L.) in New South Wales.**
J. Aust. Inst. agric. Sci. 1957 : **23** : 152–54.

The resistance of four melon varieties to *Fusarium* seedling rot and *Fusarium* wilt has been investigated in field trials. Delicious 51 proved to be highly resistant.

990 TAYLOR, J. C.
**The Summit watermelon.**
Sth. Seedsman 1957 : **20** : No. 7 : 20, 25.

Summit gave high yields in many trials on wilt-infested soils. The fruit matures early and is of good quality. This variety was developed from a cross between Calhoun Sweet and Black Diamond.

991 GOL'DGAUZEN, M. K.
**(Notes on the morphology of the fruit in the genus *Citrullus* Schr.).**
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1957 : **31** : No. 2 : 29–56. [Russian].

Details are given on the form of fruit, colour, pattern and structure of the skin, and flesh and structure of seeds in *C. edulis* and in the wild species *C. colocynthis*, *C. ancestralis*, *C. colocynthoides* and *Praecitrullus fistulosus*.

992 WINSTEAD, N. N., AYCOCK, R. & JENKINS, J. M. (JUN.)
**Reactions of watermelon plant introductions and varieties to downy mildew in North Carolina.**
Plant Dis. Reptr. 1957 : **41** : 620–22.

300 varieties and lines were investigated for resistance to *Pseudoperonospora cubensis*. 179660 and 179875 were highly resistant.

993 GALKA, A. T.
**(Developing bush forms of cucurbits).**
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1957 : No. 2 : 13–19. [Russian].

An account of breeding the melon, water melon and pumpkin for compact habit at Dnepropetrovsk is given. The methods included vegetative-sexual hybridization, wide crossing, the use of pollen mixtures and environmental training. The work on the melon (Krymka Saharnaja [Crimean Sugar] x Tahmi) x Kolhoznica + Komsomolka and the water melon Stokes x Vengerskij [Hungarian] is still continuing, although in each case plants with a compact habit and fine quality fruits have been obtained. A new forage pumpkin Dnepropetrovskaja Kustovaja 1 [Dnepropetrovsk Bush 1], which outyields the pumpkin standard Mozoleevskaja 15 by 299·6 c. per ha., was obtained by vegetative-sexual hybridization involving the egg-plant variety Kustovyj Gribovskij [Bush Gribovo] and the pumpkin Mozoleevskaja 15. Initial achievements in breeding compact forms for use as a vegetable along the following lines are reported: (1) by selection among the progeny of *Cucurbita pepo* 'Dnepropetrovskaja Kustovaja 1' x self pollen + *C. maxima* + *C. moschata*, and (2) by hybridization between the cultivated and wild forms of *C. maxima*.

994 BELIK, V. F. & PODMOGAEVA, M. I.
**(Interspecific hybridization of cucurbits).**
Agrobiologija (Agrobiology) 1957 : No. **1** : 128–32. [Russian].

Hybrids with the characters of *Cucurbita maxima*, *C. moschata* or *C. pepo*, some of economic value, were obtained by fertilizing one of these species by the pollen of the others at Birjučij Kut. Hybrid 136 (*C. maxima* x *C. pepo* + *C. moschata*), now in the fourth generation, has large fruits of good flavour and is highly productive. Hybrid 136 and other interspecific hybrids with the characters of *C. maxima* crossed readily with *C. pepo* or *C. moschata* and produced viable seed.

995 SAITO, K.
**(Studies on the induction and utilization of polyploidy in some cucurbits. II. On polyploid plants of *Momordica charantia*).**
Ikushugaku Zasshi/Jap. J. Breeding 1957 : **6** : 217–20. [Japanese].

Tetraploid strains were obtained by colchicine treatment and triploids by intercrossing $2x$ and $4x$ plants. The polyploids were inferior in economic characters to the diploid. [Cf. XXIV, 2256].

996 VOLKOV, V. JA.
**(Intravarietal crosses of greenhouse cucumber varieties).**
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1957 : **31** : No. 2 : 183–88. [Russian].

Seed of morphologically uniform varieties was reproduced in a number of different localities and sown in the greenhouse in Leningrad. The progeny from crossing different plants of the same variety ripened 8 days earlier than those from selfing and 7 days before those from intervarietal crossing. The earliest of all were progenies obtained from mother plants reproduced indoors and pollinated from plants reproduced in the open. The plants from intravarietal crossing were more vigorous and had a larger number of female flowers and of fruits per plant than those from self or cross pollination. This yield of fruits was 56% greater than that from selfing and 26·4% greater than that from intervarietal crossing in the case of the variety Klinskij 1545; in the variety Leningradskij Tepličnyj 23 [Leningrad Hothouse 23] the increases were 29·1 and 12·1%; in most cases the average fruit size was also greater.

Earlier and larger yields of fruit were obtained when some tomato pollen was added to cucumber pollen in making these crosses; an increase of 53% over the yield from selfing was obtained from pollination with pollen from another variety plus tomato pollen. Pollen of *Cyphomandra betacea* gave an increase of 27·4% in fruit yield but 33·1% in fruit size. The author recommends the addition of pollen of tomato or *C. betacea* to self pollen for overcoming the depressing effect of inbreeding in preserving valuable genotypes; the editor, however, adds a footnote to the effect that intercrossing between inbred lines in the second or third inbred generation gives better results.

997 SAGALOVIČ, E. N.
**(Hybrid seed production of vegetables including cucurbits should be organized).**
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1957 : No. 2 : 28–30. [Russian].

Soviet-bred hybrids of carrot, onion, cabbage, water melon, cucumber and tomato, and also Bulgarian-bred tomato hybrids, all of which show heterosis, are cited as examples of economically valuable hybrids. The cucumber hybrid Uspeh 221 [Success 221] (Posrednik 97 [Bridging Form 97] ♀ x Rustem 96–1 ♂) from Krymskaja, Krasnodar territory, outyields Nežinskij by 18–83%.

998 MEŠČEROV, Ė. T.
**(Production of high-yielding hybrid seeds of cucumber).**
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1957 : **31** : No. 2 : 223–25. [Russian].

Yield increases of up to 36% were obtained from seed produced by natural crossing between two varieties, the best results being obtained from combinations of varieties differing in morphological characters and in place of origin, such as Omsk x Astrahan' and Japan x Vjaznikov. Crosses between closely similar varieties or combinations in which one variety was not adapted to the region gave little or no increase or slight decreases in yield. In time of maturity the hybrids tended to resemble the earlier parent.

999 ITO, H. & SAITO, T.
**(Studies on the conditions controlling the differentiation of female, male and hermaphrodite cucumber flowers. V. Studies on the effects of pinching and the addition of growth substances on the male flowering nodes).**
Engeigaku Kai Zasshi/J. hort. Ass. Japan 1957 : **25** : 213–20. [Japanese].

Pinching the apical bud and applying α-naphthaleneacetic acid to the stem tip causes no sex reversal in the male flowering nodes. Pinching the apical bud and applying 2,3,5-triiodobenzoic acid does not affect the upper flowering nodes but induces sex reversion in the lower staminate nodes.

1000 BOOS, G. V.
**(Biological characteristics of the cucumber when grown under cover).**
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1957 : **31** : No. 2 : 234–47. [Russian].

Data are provided on vegetative development, flowering, fruit and seed production and parthenocarpy in a number of cucumber varieties when grown under glass in the vicinity of Leningrad.

1001 BUSCH, L. V.
**A study of anthracnose resistance in cucumber.**
Diss. Abstr. 1956 : **16** : Publ. No. 18,381 : 1762–63.

Seedling resistance of PI17511 to *Colletotrichum* *lagenarium* probably depends upon a single dominant gene and modifiers. Resistance in the other two introductions studied, PI163213 and PI163217, is probably polymeric. Resistant tissue reacted by a thickening of the cell walls and the formation of gum-like globular deposits in the intercellular spaces. In addition, the chloroplasts and other cytoplasmic components tended to collapse more slowly in resistant tissue, suggesting that the pathogen was less compatible with the contents of resistant cells than with those of susceptible cells.

1002 SYSKOVA, M. V.
**(Influence of temperature during the development and ripening of tomato seeds on increasing cold resistance in the following generations).**
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1957 : **31** : No. 2 : 104–10. [Russian].

When the fruits of 15 tomato varieties were kept at temperatures of 6–7° C. during the period of formation of the seeds, the capacity to germinate at 7–9° was increased in all but three of the varieties. In some of the varieties the improved capacity to germinate at low temperatures persisted in the following generation, which also gave a higher yield of fruit, which in some varieties ripened earlier.

1003 LITYŃSKI, M. & STANKIEWICZ, Z.
Obserwacje nad kwitnieniem i owocowaniem niektórych odmian pomidorów uprawianych w szklarni. (**Observations on flowering and fruiting in some tomato varieties grown in the greenhouse**).
Rolnictwo, Wrocław 1955 : No. 1 : 113–34.

In studies of nine varieties intervarietal differences in rate of early growth, duration of flowering period, percentage of dropped buds and other characters were noted. Varieties with relatively few flowers had the lowest ratio of number of ripe fruits to number of buds. The highest yield was given by Stonor's Exhibition. Within varieties, marked differences in number, weight, dry matter content and acidity of the fruits were found according to their position on the plant.

1004 HORNER, T. W. & LANA, E. P.
**A three-year study of general and specific combining ability in tomatoes.**
Proc. Amer. Soc. hort. Sci. 1957 : **69** : 378–87.

General and specific combining ability in respect of yield and fruit size were studied in six tomato varieties and all possible hybrids between them in a three-year trial. A genetic model involving two alleles per locus and neither dominance nor epistasis appeared not to fit the data obtained. Significant genotype x year interactions of uncertain origin were also detected.

1005 REUT, JA. A.
**(Choice of parent varieties for production of high-yielding hybrid seeds of tomato).**
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1957 : **31** : No. 2 : 248–50. [Russian].

Descriptions are given of the four varieties used for the experiments. Emasculated flowers were treated with pollen from a number of flowers of the pollinating variety. The best yields were obtained from hybrids between parents differing in morphological features and place of origin, such as Majkopskij Urožajnyj [Majkop Productive] x Stalingradskij and Knjaz' Borgeze, [Prince Borghese] x Stalingradskij, which gave yield increases of from 40 to 85% over the better of the two parents. In time of ripening the hybrids were intermediate between the parents but closer to the earlier than the later of the two; they seem more resistant to drought, *Macrosporium*, *Septoria* and mosaic. The branched inflorescences of Prince Borghese were dominant but in most other characters the hybrids were intermediate. The fruits were good in flavour and shape and free from splitting.

1006 **Tomato hybrids.**
J. Aust. Inst. agric. Sci. 1957 : **23** : p. 169.

The following new tomato hybrids have given yield increases of up to 66% and averaging 30%. (1) Break O' Day x Rouge de Marmande Fl. [Marmande Fl. Red] is recommended as an early glasshouse crop. (2) Grosse Lisse [Large Smooth] x Rouge de Marmande Fl. is an early cropper suitable for the metropolitan and central coastal areas. (3) Grosse Lisse x Valiant Fl. or the reciprocal promises well as a main crop for all districts.

1007 BATYGINA, T. B.
**(Interspecific hybrids of tomato).**
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1957 : **31** : No. 2 : 210–22. [Russian].

Some of the literature on crossing *Lycopersicon peruvianum* and *L. hirsutum* with *L. esculentum* is reviewed. The author in her own work has found the most efficient method of overcoming the difficulties of crossing to be the use of pollen mixtures or repeated pollination. Some of the hybrids of *L. esculentum* x *L. peruvianum* resembled *L. esculentum* in all morphological features but were resistant to *Macrosporium* and *Phytophthora*; other hybrids were intermediate in characters, some resembling var. *cerasiforme*, and this group was extremely disease resistant; a third group resembled *L. peruvianum* and its fruits were without seeds. In crosses of *L. esculentum* x *L. hirsutum* too some plants resembled *L. esculentum* but were resistant to diseases; others were intermediate and others again resembled *L. hirsutum*; of this last group some flowered more profusely, and some failed to flower at all in the long days at Leningrad.

1008 KERR, E. A.
**Breeding for high ascorbic acid content in tomatoes.**
**Abstracts of the Annual Meeting of the Canadian Society for Horticultural Science held at the Agricultural Institute of Canada, University of British Columbia, Vancouver, B.C., June 24-June 27th.**
Agric. Inst. Rev. 1957 : **12** : No. **3** : 39–40.

Using *Lycopersicon pimpinellifolium* as the source of high ascorbic acid, lines with fruit of commercial size but with two or three times the normal ascorbic acid content have been developed at the Ontario Department of Agriculture by back crossing to commercial varieties, selection and line crossing, although they do not yet equal commercial varieties in yield or quality. Data from $F_1$ and $F_3$ segregating lines indicate that the ascorbic acid content of plants with high pigmentation, $hp_1 + hp_2$, is 20 to 25% higher than that of normal segregates, probably as a result of a pleiotropic effect of *Hp* genes.

1009 VOS, N. J.
Variaties van het vitamine C-gehalte in tomaten onder invloed van verschillende factoren. (**Variations in the vitamin C content of tomatoes under the influence of different factors**).
Voeding 1957 : **18** : 133–42.

Observations are presented on the vitamin C content of the tomato Tuckgreen, *Lycopersicon pimpinellifolium* and some hybrids between them. Ascorbic acid content was higher in *L. pimpinellifolium* and the smaller-fruited hybrids than in the larger-fruited forms.

1010 BATYGINA, T. B.
(**Some anatomical characteristics of tomato hybrids**).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1957 : **31** : No. 2 : 131–33. [Russian].

Hybrids of *Lycopersicon esculentum* x *L. peruvianum* resembled the seed parent in morphological characters but in leaf anatomy they showed resemblance to *L. peruvianum*, having a xeromorphic structure with one layer of palisade cells and six layers of spongy parenchyma.

The hybrid *L. esculentum* x *L. hirsutum* resembled the wild species in external morphology and the cultivated in leaf anatomy, with six layers of spongy parenchyma.

The hybrid Cerasiforme x Bonny Best, when pollinated with *L. hirsutum*, gave rise to three types, resembling *L. esculentum* and the reciprocal hybrids *L. esculentum* x *L. hirsutum* respectively; anatomically the first resembled *L. hirsutum* and the other two resembled the hybrid.

1011 LEFORT, M.
Structure inframicroscopique des chloroplastes de certains mutants dépigmentés chez *Lycopersicum esculentum.* (**Submicroscopic structure of the chloroplasts of certain unpigmented mutants of *L. esculentum***).
CR Acad. Sci., Paris 1957 : **245** : 718–20.

Electron microscope studies of an X-ray mutant of the *albina* type showed that loss of pigment was associated with lack of the normal lamellar structure of the chloroplast.

1012 GÜNTHER, E.
Untersuchungen an Monoektochimären zwischen *Lycopersicon esculentum* Mill. und *Solanum nigrum* L. (**Investigations on monectochimeras between *L. esculentum* Mill. and *S. nigrum* L.**).
Biol. Zbl. 1957 : **76** : 343–51.

Six chimeras with a core of *L. esculentum* 'Yellow Pear-shaped' and an outer layer of *S. nigrum* fell into two groups with broad and narrow pinnae respectively. While fruits of the latter group were characterized by the expected elongated form of the tomato component, those of the former group were almost spherical. This was traced to the tetraploidy of the tomato core, tetraploid forms of the pear-shaped variety having nearly round fruits. With the exception of one of the chimeras the fruits all had an epidermis containing anthocyanins. The exception had totally yellow fruits, a condition which, as segregation ratios in the progeny indicated, had resulted from mutation of the epidermal tissue of the nightshade component.

1013 BÖHME, H.
Weitere Untersuchungen zum Problem der genetischen Bedeutung von Pfropfungen zwischen genotypisch verschiedenen Pflanzen. (**Further investigations on the problem of the genetical significance of grafts between genotypically different plants**).
Z. Pflanzenz. 1957 : **38** : 37–50.

In experiments in which six varieties of *Lycopersicon esculentum* were grafted on each other in various combinations, no evidence of heritable changes in the scion was observed either in the year of grafting or in following generations. In four cases out of **113** a difference in fruit colour was observed between the experimental scion and the control scion [cf. XXV, **1491**]; this difference appeared to result from a tendency to somatic mutation in the scion material which occurred independently of the stock variety. In grafts of cultivated tomato varieties on *L. peruvianum*, *L. hirsutum*, *Nicotiana tabacum* and *N. rustica*, no effect of stock upon scion fruits or progeny was found.

1014 NAZAROV, S. P.
(**An experiment on vegetative hybridization of the tomato**).
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1957 : No. 3 : p. 80. [Russian].

The juice from a fruit of Humbert was injected into partially emptied locules of a fruit of Želtyj Limonovidnyj [Yellow Lemon] at Nežin. The fruit developed normally, produced seed and gave rise to a few plants which were not different from Želtyj Limonovidnyj. The $F_2$, which was raised from a single large fruit, segregated with regard to most morphological characters, including fruit shape and size. Such segregation continued in the $F_3$, when changes in fruit colour also occurred.

1015 ALPAT'EV, A. V. & ERINA, O. I.
(**Intrahybrid crossing of tomatoes**).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1957 : No. 2 : 46–52. [Russian].

A method of hybridization, involving $F_2$ or $F_3$ hybrid plants from the same original cross but grown, previously to crossing, in different environments, is described. Its advantages over back crossing or multiple hybridization are said to be that the progenies thus obtained are genetically more uniform and show a better combination of the desired parental characters. The hybrids obtained in this way showed improvements in earliness, fruit size and productiveness. The efficacy of this breeding method was improved by combining it with continuous selection, using the position of fruit clusters on the plant as a criterion for earliness and flower and ovary characteristics as criteria for fruit shape and size.

1016 PIMAHOV, F. S.
(**New varieties of tomato and their introduction into collective farming in Uzbekistan**).
Trud. priklad. Bót. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1957 : **31** : No. 2 : 267–69. [Russian].

Tests of over 100 varieties have shown Majkopskij Urožajnyj 2090 [Majkop Productive 2090], Temnokrasnyj 2077 [Dark Red 2077] and Rannij VIR 2094 [Institute of Plant Industry Early 2094] to be specially promising, having outyielded the standard, Bison, by 13–36%; when sown in the open in Uzbekistan at the beginning of April they bear fruit from June to October; and the fruit exceeds Bison in content of dry matter, sugars and vitamin C.
The three varieties are described briefly.

1017 GILBERT, J. C., MCGUIRE, D. C. & TANAKA, J.
**A wider variety of horticultural types now available in root knot resistant tomatoes.**
Hawaii Fm. Sci. 1957 : **6** : p. 5.

Manalucie has been crossed with an Hawaii line to produce the new variety HES Hybrid W2, which is recommended for winter planting and high districts. It is resistant to *Meloidogyne incognita*, *Fusarium oxysporum* f. *lycopersici*, *Stemphylium solani*, *Cladosporium fulvum*, spotted wilt virus and cracking. The fruit resembles that of Manalucie but matures earlier.

1018 BREŽNEV, D. D.
(**The evolution of tomatoes**).
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1957 : **31** : No. 2 : 13–17. [Russian].

The genus *Lycopersicon* is regarded as having separated relatively recently from *Solanum*, one line having given rise to the *L. esculentum* group with carotenoids and lycopene, another to the group *L. peruvianum* and *L. hirsutum*, with β-carotene in the fruits; the latter group is probably older than the former; *L. esculentum* ssp. *cerasiforme* is considered to be the prototype from which the rest of the cultivated group have evolved and since the first tomatoes grown in Europe had ribbed fruits it is thought probable that ssp. *cerasiforme* has contributed to the development of the modern round-fruited forms by later hybridization.

1019 RICHARDSON, R. W. (JUN.) & ALVAREZ L., E.
**Pollination relationships among vegetable crops in Mexico. I. Natural cross-pollination in cultivated tomatoes.**
Proc. Amer. Soc. hort. Sci. 1957 : **69** : 366–71.

Disparities in natural cross pollination of the potato-leaved (*cc*) varieties Hoja de Papa and Red Jacket in different localities appeared to be primarily dependent upon inequalities in the size of the populations of *Augochloropsis ignita.* The greatest amount of natural cross pollination occurred at Jaloxtoc, with mean rates of 11·4% in 1952 and 7·0% in 1953.

1020 GÜNTHER, E.
Die Nachkommenschaft von *Solanaceen*-Chimären. (**The progeny of chimeras in the Solanaceae**).
Flora, Jena 1957 : **144** : 497–517.

The chimera *Lycopersicon esculentum* + *Solanum nigrum* set very few seeds on selfing and all were inviable, although the flowers, formed from the tomato component, had 89·1% of good pollen. This pollen functioned normally when applied to the original tomato from which the chimera was made. When the chimera was pollinated with tomato pollen very low sets were obtained; sets were improved when mixtures of pollen from both components were employed. The seeds all produced pure *S. nigrum* but the $F_2$ of one chimera segregated into 72 plants with purple : 21 with yellow fruits; the chimera itself had yellow fruits but no yellow fruits were ever found in the progeny of the *S. nigrum* control and their appearance is ascribed to a mutation, possibly induced by the chimeral condition.
The reverse chimera, *S. nigrum* + *L. esculentum* 'Golden Queen', gave a progeny comprising 367 normal *S. nigrum* plants, 2 *S. nigrum* plants with yellow fruits, which bred true in the $F_2$, and one plant with one normal branch and one branch showing marked morphological deviations; the flowers on this branch were abnormal and reduced in fertility. The $F_2$ plants from the normal branch were all normal but those from the other showed the same abnormalities, some in a greater degree. No transmission of the anomalies occurred when the abnormal tissue was grafted reciprocally on to normal tissue and they are therefore not thought to be the result of virus infection. The $F_3$ plants all displayed the same abnormalities.
A chimera of *L. esculentum* 'Yellow Pear-shaped' + 2 layers of *S. nigrum* gave an $F_1$ progeny consisting exclusively of *S. nigrum* plants; a similar chimera in which the tomato component was tetraploid produced progeny with a number of chlorophyll deficiencies and morphological aberrations in the first five leaves although the original nightshade produced only normal plants in its progeny. The $F_2$ progeny of the abnormal plants consisted entirely of normal *S. nigrum* plants.
It is pointed out that none of the alterations observed was a directed change in the direction of the other graft component and most of them were not reproducible.

1021 OREL, L. I.
(**Effects of the age of pollen upon the fertilization process and embryogenesis in tomatoes**).
Dokl. Akad. sel'skohozjajstv. Nauk Lenin. (Proc. All-Un. Lenin Acad. agric. Sci.) 1957 : No. **1** : 11–14. [Russian].

Reduction in germination percentage was observed in tomato pollen stored for 5–6 days or 9–10 days and tomato plants pollinated with the stale pollen showed a reduction in fruit set and the number of seeds formed per fruit. The fertilization processes in plants fertilized by fresh pollen and by pollen 5–6 days old were similar, but in the latter case the development of the embryo was greatly retarded. In one case a variety fertilized by stale pollen of another variety failed to set fruits altogether, although in artificial culture the pollen was found to be 0·5% viable. It was found in this instance that the growth of the pollen tubes was retarded to such an extent that when they reached the embryo sac the egg cell had already degenerated.

1022 DASKALOV, H.
(**Tomato varieties and our canning industry**).
Selskostopan. Misăl 1956 : No. **10** : 613–21. [Bulgarian].

An article by P. Daskalov in which the properties of Bulgarian tomatoes are discussed is criticized. It is shown that Zarja [Dawn] x Comet is valuable for its earliness, high yield and fine quality of fresh fruit and that 10 x Bison is a good early outdoor variety for export. Plovdivska Konserva [Plovdiv Canning] is said to be productive and possess good technological properties, though it is late in ripening. It had high contents of dry matter, sugar and vitamin C and is said to be superior to the varieties mentioned by P. Daskalov. Reference is made to the new canning tomatoes Heterozisna Konserva [Heterotic Canning] and the recent standard 10 x Rutgers. The former ripens earlier than Plovdivska Konserva and is 20% more productive and the new standard equals Zarja x Comet in earliness and outyields all other varieties. The flavour and technological properties are good.

1023 BREŽNEV, D. D.
**(History of the study of the genus *Lycopersicon* Tourn.).**
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1957 : **31** : No. 2 : 5–12. [Russian].

A number of references to the tomato in the early literature, beginning with Mattioli in 1554, are cited, the original classification given by Tournefort is reproduced and the criticisms to which it was subjected by certain later authors are mentioned. The author does not share the views of those critics who would combine the genus *Lycopersicon* with *Solanum*.

1024 IVANOVA, K. V.
**(Towards our knowledge of *Lycopersicon peruvianum* Mill.).**
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1957 : **31** : No. 2 : 19–28. [Russian].

A description is given of the species and of the views of a number of authors concerning its systematic position and its hybrids with other species. At the Institute of Plant Industry, Leningrad, hybrids between *L. esculentum* and *L. peruvianum* sometimes resembled *L. esculentum* ssp. *cerasiforme* and sometimes *L. peruvianum*; the latter type was sterile, the former type usually segregated but one hybrid produced in a cross in 1952 remained constant in the $F_2$ and $F_3$ and is described.

*L. peruvianum* proved highly resistant to *Septoria lycopersici* and *Phytophthora infestans* though the resistance was not so complete as in *L. hirsutum* and varied in different specimens.

1025 ARTEM'EV, G. V.
**(Tomato cultivation in the arctic region).**
Sad i Ogorod (Gdn. & Veg. Gdn.) 1957 : No. 5 : 18–21. [Russian].

Hybrid 337 was obtained by vegetative-sexual hybridization of the tomato variety Gruntovyj Skorospelyj [Outdoor Early] involving the use of *Solanum schreiteri* and *S. punae* as stocks. It is tolerant of – 2° C. without screens.

1026 HROBRYH, N. D.
**(The question of determining resistance to *Phytophthora* in tomatoes).**
Trud. priklad. Bot. Genet. Selekc. (Bull. appl. Bot. Gen. Pl.-Breed.) 1957 : **31** : No. 2 : 191–96. [Russian].

A higher degree of infection was obtained by spraying detached leaves with a spore suspension than from whole plants; green fruits also gave reliable results. Tests of a number of varieties showed Urožajnyj [Productive] to be the most resistant of the cultivated tomatoes. *Lycopersicon hirsutum* was resistant in both fruits and leaves, *L. peruvianum* only in the fruits. There was no correlation between the reaction of fruits and leaves but most forms were more susceptible in the fruits than the leaves. Hybrids derived from Urožajnyj x *L. hirsutum* showed a high degree of resistance, as did the varieties Holodostojkij 1 [Cold-resistant 1], Red Cerasiforme, Yellow Currant tomato, Temnokrasnyj [Dark Red], Štambovyj Rannij [Early Upright 1563], Danish Export and Skorospelyj Volžskij [Early Volga].

1027 BARHAM, W. S. & WINSTEAD, N. N.
**Inheritance of resistance to root-knot nematodes in tomatoes.**
Proc. Amer. Soc. hort. Sci. 1957 : **69** : 372–77.

Some breeding lines received from the Texas and Hawaii Agricultural Experiment Stations and tested in North Carolina proved to be resistant to *Meloidogyne incognita*, *M. incognita* var. *acrita*, *M. javanica* and *M. arenaria*. Data from crosses and back crosses involving the resistant line Hawaii 5229 and susceptible line STEP174 indicated that resistance to all four nematodes depended upon a single gene. Although this gene is incompletely dominant, the degree of resistance in heterozygotes is sufficient to warrant the use of $F_1$ hybrids between homozygous susceptible and homozygous resistant lines.

1028 BEST, R. J. & GALLUS, H. P. C.
**Further evidence for the transfer of character-determinants (recombination) between strains of tomato spotted wilt virus.**
Enzymologia 1955 : **17** : 207–21.

When two strains of the tomato spotted-wilt virus were inoculated together into tomato plants and plants of *Nicotiana glutinosa*, at the Waite Agricultural Research Institute, Adelaide, S. Australia, the tissues which had been systemically invaded yielded isolates which were found to be new strains differing from the two parent viruses but combining some characters from each. Several such isolates are described and it is concluded that the virus particles carry on them determinants governing the nature of their reaction with the host plant and that new strains are formed by the interchange of such character determinants.

1029 Kumar, L. S. S. & Chavan, V. M.
**Improvement of pulse crops in Bombay State.**
Res. Ser. Indian Counc. agric. Res. 1957 : No. 11 : Pp. 9.

Agronomic characters and the results of chemical analyses and cooking tests were recorded for a number of improved strains. The F–52 and F–18 strains of *Cajanus cajan* were high yielding and very resistant to wilt. Co–1–1, a strain of *Dolichos biflorus*, appeared to be completely resistant to mosaic. Nagar 2–8 and Sind Kheda 1–1, strains of *Phaseolus mungo*, were found promising. China 781 and the local Jalgaon 310 (*Ph. aureus*), gave good yields and promising hybrids have been produced from crosses between Chinese and local strains. Some high-yielding lines of *Ph. aconitifolius* and some wilt-resistant lines of *Cicer arietinum* have been selected.

1030 Müller, H. J.
Zur Frage der *Bruchus*-Resistenz von Ackerbohnen (*Vicia faba* L.). **[The question of *Bruchus* resistance in field beans (*V. faba* L.)].**
Z. PflKrankh. 1955 : **62** : 598–602.

Experiments are described which show that the variety Rastatter is less attacked by *B. rufimanus* than is the variety Schlanstedter, even when the two are sown at different times so that their pods develop together. The number of eggs laid on the leaves of Schlanstedter was significantly greater and this indicates that the difference in attack is caused by an actual preference of the susceptible variety by the egg-laying females.

1031 Andeweg, J. M. & van Steenbergen, A.
Praktijkproeven met pronkbonen 1955–1956. **(Field trials of runner beans, 1955-1956).**
Meded. Dir. Tuinb. 1957 : **20** : 453–55.

Of 38 selections tested in the Netherlands, 18 narrow-podded types are recommended.

1032 Wall, J. R. & York, T. L.
**Inheritance of seedling cotyledon position in *Phaseolus* species.**
J. Hered. 1957 : **48** : 71–74.

A detailed report is presented of investigations on *Ph. vulgaris* x *Ph. coccineus*, the main results of which have already been summarized [XXVII, Abst. 932].

1033 Zaumeyer, W. J. & Thomas, H. R.
**New snap and Pinto beans resistant to several diseases.**
Phytopathology 1957 : **47** : p. 454. (Abst.).

The green-podded bush snap bean 1831–9 (mosaic-resistant Topcrop x Tenderpod) and dry-bean type Columbia Pinto [(rust-resistant Pinto 5 x Great Northern 123) x Pinto 78] have been released in the USA. The former is immune from common bean mosaic, the New York strain 15 of common bean mosaic and pod mottle. The latter incorporates resistance to common bean mosaic, the New York strain 15, curly top and several races of rust. Its beans are attractive and larger than those of commercial varieties now in use.

1034 Block, P.
Morphologische und variationsstatistische Untersuchungen an Buschbohnensorten. **(Studies of morphology and statistical variation in dwarf bean varieties).**
Albrecht-Thaer-Arch. 1957 : **2** : 59–60.

A comparative study of five German varieties showed that the following characteristics display little intravarietal variation but marked intervarietal differences: leaf colour during the first few weeks after germination; development and form of the leaves; plant habit depending on the number and growth of side shoots; growth period; flower colour; pod length; height of plant up to the first fruiting node; number of stems; total straw weight; seed colour, form and length; 100-seed weight; and protein content and imbibition power of the seed. In addition relationships characteristic for each variety were found between leaf colour and growth in height, between length, breadth and thickness of the dry pods, between protein content, imbibition and germination of the seed, between length, breadth and thickness of the seed and between protein and water content of the seed.

1035 Baggett, J. R.
**Effects of genetic segregation in *Phaseolus vulgaris* on the symptoms induced by bean yellow mosaic virus.**
Phytopathology 1957 : **47** : 365–68.

When inoculated with a pod-distorting strain of the above virus, $F_3$ families from a cross between the resistant variety Great Northern UI31 and susceptible OSC21 (a derivative of Blue Lake) showed symptoms similar to those of each parent, as well as symptoms ranging widely in type and severity. Three major genes may be responsible for the difference between the resistant and susceptible reactions while many modifiers may influence the type and severity of symptoms.

1036 Bemis, W. P.
**Inheritance of a base seed-coat color factor in lima beans.**
J. Hered. 1957 : **48** : 124–27.

As the result of a study of the $F_2$ of Green-seeded Henderson (white seed coat) x Illinois Accession 1532 (black seed coat) and of other crosses, the author postulates the occurrence of a gene designated *B* which segregates independently of *C*, *P* and *R* and which in the presence of *C* governs the development of a basic blue colour in immature beans, prior to the development of the colours of the dry bean for which *P* and *R* are responsible [cf. XXIV, 3478]. *B* is linked with *G* for green cotyledons, the distance between the genes being calculated as 30 ± 3·7 units.

1037 **Composition of southern peas.**
Sth. Coop. Ser. Bull. 1951 : No. 15 : Pp. 29.

Analyses were made of a number of cowpea varieties grown in several American states. Considerable varietal differences were found in protein and thiamin contents; varieties which had a particularly high protein content tended to have a high thiamin content.

1038 Jenkins, W. F.
**Little difference found in freezing quality of peas.**
Miss. Fm. Res. 1956 : **19** : No. **11** : p. 5.

Data are included on the reaction to diseases and colour when canned for five cowpea varieties commonly grown in Mississippi and on the ascorbic acid, sugar, starch, protein, fibre and moisture contents of four of these varieties when fresh, blanched, thawed and cooked.

1039 Weber, C. R. & Horner, T. W.
**Estimates of cost and optimum plot size and shape for measuring yield and chemical characters in soybeans.**
Agron. J. 1957 : **49** : 444–49.

A uniformity trial of soya beans was analysed to ascertain the efficiency and cost of various designs and plot sizes and shapes for measuring yield, oil and protein content and iodine number of the oil. Gains in precision with regard to yield averaging 31·2, 15·7 and 18·3% resulted from the application of lattice square, simple lattice and triple lattice designs, respectively. Long narrow plots were more efficient than short broad plots. The optimum plot size in respect of cost was 3·2 times the basic unit of 8 x 2 ft.

1040 **New Crest soybean for Canadian growers.**
What's New Crops Soils 1957 : **9** : No. **8** : p. 28.

The above variety, whose origin is not given, was developed by the Central Experimental Farm of the Canadian Department of Agriculture and is characterized by an erect, bushy habit, a stiff stem and rapid growth. Maturing a few days later than Acme it is adapted to areas similar to southern Manitoba, where it has given good yields with high oil content.

1041 Van Duyne, F. O., Charles, V. R., Batcher, O. M. & Hivon, K. J.
**Palatability and ascorbic acid and sugar contents of six varieties of vegetable-type soybeans.**
Soybean Dig. 1957 : **17** : No. 9 : 18–20.

The soya beans Favorite, Giant Green, Halito, Jogun, Kia and Sanga were evaluated with respect to their palatability when cooked, frozen and canned and their moisture, ascorbic acid and sugar contents when freshly harvested and processed.

1042 Günther, G.
Beobachtungen an Leguminosenpfropfungen. (**Observations on grafts with Leguminosae**).
Züchter 1957 : **27** : 278–80.

Grafts of young seedlings of three soya-bean varieties on the varieties Saxa and St. Andreas of dwarf bean (*Phaseolus vulgaris*) caused various growth disturbances in the soya-bean scions, including tumour formation in the grafts on St. Andreas. The seeds on the scions were smaller than the normal but otherwise unchanged and the seedlings produced from them were not earlier in maturity as reported by Leščenko and Tjugina [XX, 1997].

1043 Bernard, R. L., Smith, P. E., Kaufmann, M. J. & Schmitthenner, A. F.
**Inheritance of resistance to *Phytophthora* root and stem rot in the soybean.**
Agron. J. 1957 : **49** : p. 391.

Arksoy, AK, CNS, Mukden, Blackhawk, Dorman, Harly, Illini and Monroe showed resistance to a species of *Phytophthora* causing a root and stem rot in Ontario and the USA. The first four varieties are of oriental derivation while each of the remainder includes one of these varieties in their parentage. Data from crosses of susceptible varieties with Blackhawk

(Mukden x Richland), Mukden, Illini (selection of AK) and Harly (Mandarin x AK) indicated that resistance depends upon a single dominant gene which is the same in Mukden and AK.

1044 Haupt, W.
Photoperiodische Reaktion bei einer als tagneutral geltenden Sorte von *Pisum sativum*. **(Photoperiodic reaction in a variety of *P. sativum* regarded as day neutral).**
Ber. dtsch. bot. Ges. 1957 : **70** : 191–98.

By retarding flowering through removal of the cotyledons and culture on a suitable sterile medium, the normally day-neutral early variety Kleine Rheinländerin [Little Rhineland Maid] was induced to behave as a long-day plant. Conversely, acceleration of flowering in the long-day late variety Aldermann, by grafting on to an early-flowering stock, reduced its dependence upon long photoperiods.

1045 B. Varga, M.
Néhány borsófajta gyökerének auxinérzékenysége. **(The sensitivity of the roots of some pea varieties to auxin).**
Agrokémia és Talajtan 1956 : **5** : 457–60.

In tests of the reaction to indole-3-acetic acid of excised pieces of roots of six varieties grown in Hungary, the slow-growing varieties proved more sensitive than the more rapidly growing peas, root growth being stimulated at the lowest concentrations in both cases.

1046 Dowdles, D.
**Pea varieties in southern coastal Queensland.**
Qd. agric. J. 1957 : **83** : 248–52.

In this review several new introductions are discussed with reference to their performance in recent trials in southern Queensland.

1047 Sprent, J. I. & Barber, H. N.
**Leaching of a flower inhibitor from late varieties of peas.**
Nature, Lond. 1957 : **180** : 200–01.

Barber and Paton [cf. XXII, 3087 and XXVI, 1914] have concluded from experiments on grafting between genetically early and late varieties of *Pisum sativum* that the dominant gene *Sn* causing late flowering is responsible for the production of a substance delaying flowering. Further investigations have shown that this inhibitor passes into the plumule from the cotyledons during the period of 10–14 days after germination. The inhibitor may be leached out from young cuttings soaked in water before planting in soil, provided not more than 15–20 days have elapsed since germination.

1048 Inoue, Y. & Suzuki, Y.
**(Studies on flower-bud differentiation, flowering and fruit setting in the pea. IV. On flowering and fruit setting).**
Engeigaku Kai Zasshi/J. hort. Ass. Japan 1957 : **25** : 221–26. [Japanese].

A series of 11 Japanese and introduced varieties was studied. Varietal differences were noted in flowering period, number of flowers and pods and number of 2-flowered inflorescences.

1049 Yen, D. E. & Cruickshank, I. A. M.
**The breeding of peas resistant to *Fusarium* wilt.**
NZ J. Sci. Tech. 1957 : **38** : 702–05.

Wilt-resistant lines are being developed from Greenfeast, William Massey, Onward, Partridge and Blue Prussian by pure-line selection and back crossing. These are indistinguishable from the susceptible varieties in all important agronomic characters.

1050 Buxton, E. W.
**Differential rhizosphere effects of three pea cultivars on physiologic races of *Fusarium oxysporum* f. *pisi*.**
Trans. Brit. mycol. Soc. 1957 : **40** : 305–16.

Continuing a study previously reported [XXVII, 3601] it has now been shown that the pea cultivars Onward, Alaska and Delwiche Commando exert different effects on the soil microflora. Onward, susceptible to race 1 of *F. oxysporum* f. *pisi*, supports more fungi, bacteria and actinomycetes in its rhizosphere than do the other two varieties, which are both resistant to race 1. Germination of the spores of the three races of the pathogen is stimulated or inhibited by rhizosphere extracts in the same way as has already been reported for root exudates, except that spores of race 3 did not germinate well in Alaska rhizosphere extract although this variety is susceptible. Wilting of Onward in plots inoculated with spores of race 1 was less severe in plots which had previously been cropped with the two resistant varieties.

1051 Ahmadeev, G. H.
**(For an increased production of seed legumes in Baškiria).**
Zemledelie (Agriculture) 1957 : No. 4 : 81–82. [Russian].

Varieties of chickpea and *Lathyrus* productive of seed and resistant to drought under Baškirian conditions are listed. The growth periods of the chickpea varieties do not exceed 88 days and those of the other crop are even shorter.

1052 MENEZES, O. B. DE
Genética e melhoramento do guando (*Cajanus indicus* Spreng.). [**Genetics and improvement of the pigeon pea (*C. indicus* Spreng.)**].
Ceres, Minas Gerais 1956 : **10** : No. 55 : 20–44.

Studies on the genetics of testa colour, standard-petal colour, pod colour, pod size and habit are reported. Testa colour depended on the interaction of two loci: white, *pr*; chocolate, *pR*; spotted, *Pr*; and black, PR. Pigmentation of the standard petal was genetically controlled as follows: yellow, *Apcevs* or *apcevs*; yellow streaked with red, *ApceVs*; uniform purple, *ApCEvs*; yellow streaked with purple, *ApCevs*; purple streaked, *ApCEVs*; and blood red, *ApCEVS*. There were three types of pod pigmentation: green *ld*; green with maroon markings, *Ld*; and maroon, *LD*. The mode of inheritance of pod size was uncertain. Plant height and angle of secondary branching were quantitatively inherited.

1053 FINLEY, A. M.
**Wheat streak mosaic, a disease of sweet corn in Idaho.**
Plant Dis. Reptr. 1957 : **41** : 589–97.

Field surveys indicated that wheat streak mosaic is confined to Golden Cross Bantam and related inbreds. Tests of these strains revealed that resistant strains may be developed.

1054 WHITELEY, J. R., THOMAS, W. I. & JOHNSON, I. J.
**Cross-incompatibility in maize.**
Agron. J. 1957 : **49** : 513–18.

Crosses and back crosses were made at Ames, Iowa, among several inbred popcorn lines which were either receptive to dent pollen and homozygous *gaga* or nonreceptive and homozygous $Ga^sGa^s$. Most of the $F_1$ crosses were completely receptive to *ga* pollen but a few were only partially receptive and one was nonreceptive, suggesting that several alleles governing varying receptivity to *ga* pollen may be present. In the $F_2$ populations involving crosses with inbred 17, lower percentages of nonreceptive plants were found than had been expected and it is tentatively suggested that this may be explained by a reversal of the competitive relationship of $Ga^s$ and *ga* pollen on $Ga^sga$ silks. The performance of $F_1$, $F_2$ and back-cross populations involving the popcorn inbred 4Co63 indicated that in this case plants apparently of the genotype $Ga^sga$ completely inhibited the growth of *ga* pollen tubes even in the absence of competing $Ga^s$ pollen.

1055 THOMAS, W. I.
**Inheritance of pollen restoration and transmission of cytoplasmic sterility in popcorn.**
Iowa St. Coll. J. Sci. 1957 : **31** : 531–32. (Abst.).

Data from crosses and back crosses among three groups of plants: (1) nine inbred popcorn lines not capable of restoring pollen fertility, (2) two dent inbreds, Tx127C and K55, which are capable of restoring fertility to cytoplasmically male sterile lines and (3) a number of male sterile stocks indicate that restoration of pollen fertility is determined by a single dominant gene. One cross between a popcorn inbred, 28, and Tx127C gave results which did not fit a monogenic ratio. The genes for pollen restoration in Tx127C and K55 were thought to be allelic and in a search for further restoring lines a popcorn line was found which was as effective as Tx127C or K55 and in which fertility restoration is probably also determined by a single dominant gene. Some inbred popcorn lines in the process of conversion to cytoplasmic male sterility exhibited partial pollen fertility which decreased with additional back crossing. This is thought to result from the interaction of modifier genes, diminishing as the proportion of the non-current parent genotype decreased. A method of simultaneously transferring cytoplasmic male sterility and pollen fertility restoration is briefly described.

1056 HIROE, M.
**A cytotaxonomic comparison of parsley and celery.**
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1955 : **68** : 201–03.

The chromosome morphology of the above two plants is described. In view of the marked resemblances between the two species in respect of gross morphology and caryotype, it is recommended that parsley be reallocated to the genus *Apium*.

## ECONOMIC LOWER PLANTS

1057 SCHULZE, T.
Zur Variabilität des Alkaloidgehalts von "*Claviceps purpurea*" in der Oberlausitz. (**On the variability in alkaloid content of *C. purpurea* in Oberlausitz**).
Pharmazie 1953 : **8** : 412–16.

Differences in the alkaloid content of 48 ergot samples from different localities in the Oberlausitz region of East Germany did not appear to be closely related to environmental conditions.

Individual sclerotia within populations varied widely both in alkaloid content and in ability to grow in artificial culture and these differences were retained in the progenies, indicating that the populations were composed of genetically distinct physiological races.

1058 Arakatsu, Y. & Ashida, J.
**Studies on the adaptation of yeast to copper. XII. Amino acid synthesis as a copper resistance mechanism of a variant.**
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1956 : **69** : 67–75.

The resistance to copper of the strain described earlier [XXVII, 2561–3] appears to be associated with the ability to synthesize glutamic acid in the presence of copper.

1059 Murayama, T., Imai, M. & Ashida, J.
**Studies on the adaptation of yeast to copper. XIII. Effect of copper on the amino acid pool.**
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1956 : **69** : 97–102.

Copper-resistant strains of yeast [cf. 1058] were found to contain relatively less free glycine and serine than material unadapted to copper.

1060 Ashida, J. & Imai, M.
**Origin of copper resistant cells. Studies on the adaptation of yeast to copper XV.**
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1956 : **69** : 560–70.

Experiments to ascertain the nature of acquired resistance to copper are reported but no definite conclusions as to the relative roles of adaptation, spontaneous mutation and selection could be drawn.

1061 Roman, H. & Jacob, F.
Effet de la lumière ultraviolette sur la recombinaison génétique entre allèles chez la levure. (**Effect of ultraviolet light upon genetical recombination between alleles in yeast**).
CR Acad. Sci., Paris 1957 : **245** : 1032–34.

The rate of production of homozygous adenine-independent forms during the vegetative growth of diploid adenine-requiring cultures of *Saccharomyces cerevisiae* heteroallelic for two recessives at the locus for adenine utilization was greater than could be accounted for by mutation and is attributed to mitotic recombination. The rate was increased more than a thousand times by treatment with small doses of ultraviolet rays lasting 90–140 seconds.

1062 Fägersten, E. G.
**Some nutritional and biochemical studies on seven adenine-requiring yeast mutants.**
Diss. Abstr. 1957 : **17** : Publ. No. 20,377 : 725–26.

Adenine, hypoxanthine and high concentrations of xanthine were the only compounds tested which satisfied the purine requirements of seven mutants of *Saccharomyces cerevisiae.* The frequency of back mutation was determined; it was established that no cross nutrition occurred among the mutants. When grown on limited adenine some mutants secreted p-aminobenzoic acid and an amine tentatively identified as 4(5)-aminoimidazole or its ribotide or riboside. A mutant secreting 4(5)-aminoimidazole always produced pink pigment. Secretion of p-aminobenzoic acid was under genetic control.

1063 Laskowski, W. & Stein, W.
Ein Fall kontrollierter Artumwandlung bei Hefen. (**A case of controlled species transformation in yeast**).
Naturwissenschaften 1957 : **44** : p. 452.

Among colonies grown from 128 ultraviolet-irradiated isolated cells of diploid *Saccharomyces cerevisiae,* one produced a proportion of round cells distinct from the normal oval cells. Colonies obtained by isolating the round cells consisted predominantly of this type which has been identified as *S. florentinus.*

1064 Jabbar, M. A.
**Studies on mating reaction in yeast.**
Pakist. J. Sci. Res. 1957 : **9** : 11–15.

Intensity of mating reaction in *Saccharomyces carlsbergensis* was found to vary with the composition of the substrate. When the concentration of malt was varied, most gametes were produced in 8–16% malt, the largest gametes in 2–4% and no mating reaction occurred in solutions of less than 0·01%.

The effect of twelve sugars and α-methyl glucoside was investigated. The percentage of gamete formation was high when glucose, raffinose, inulin, sucrose and maltose were used, and the largest gametes were produced in media containing glucose, raffinose, maltose and galactose; in both cases maltose produced the greatest effect.

Ten nitrogen compounds were found to stimulate mating reaction; of these leucine was found most effective. The largest gametes were produced in media containing ammonium chloride or sulphate.

1065 LINDEGREN, C. C., OGUR, M., PITTMAN, D. D. & LINDEGREN, G.
**Respiratory competence in the diagnosis of gene-controlled phenotypes in *Saccharomyces*.**
Science 1957 : **126** : 398–99.

Of two strains unable to ferment melezitose yet able to produce a melezitose-fermenting diploid hybrid, one was found to be in a condition described as respiration deficient although carrying the dominant gene controlling melezitose fermentation while the other, described as respiration sufficient, carried the recessive melezitose allele. A similar effect of respiratory deficiency was found in studies of galactose and maltose fermentation and adenine utilization. In another case, the brown adenine-requiring parents of a pink hybrid proved to be respiration deficient, the condition being genically controlled in one and cytoplasmically in the other, respiratory competence in the hybrid being restored by the complementary action of gene and cytoplasm. From the observation that a few respiration-deficient offspring may be obtained from any hybrid between respiration-sufficient strains, it is inferred that the respiratory granules are often lost during the formaton of spore plasm from the epiplasm. In view of the above results, the need for routine tests of segregants for respiratory competence in genetical studies of slow fermentation, adenine synthesis and pigmentation is stressed.

1066 BOSE, S. R.
**Mitosis in vegetative hyphae of higher fungi (Hymenomycetes).**
Nature, Lond. 1957 : **180** : 45–46.

In a study of mitosis in a wild variety of *Psalliota campestris* and in *Polyporus cuticularis* by the squash technique, pretreatment at 15°–16° C. for 1½ hr. with esculin and 1% saponin, fixation with Fleming's strong fluid and staining with acetoorcein and Feulgen's reagent gave the most satisfactory results. The chromosome number of the former species was found to be $n = 9$. That of *P. cuticularis* is not given.

## BOOK REVIEWS

1067 COCHRAN, W. G. & COX, G. M.
**Experimental designs.**
John Wiley & Sons Inc., New York & Chapman & Hall Ltd., London 1957 : 2nd Ed. : 82s. : Pp. xiv + 611 : tables.

In the seven years since the publication of the first edition [cf. XXI, p. 220], this book has established itself as the standard work of reference for all users of the many experimental designs that have been developed by statisticians to deal with material shewing appreciable random variation. Lists are included of most important designs, with accompanying accounts of their uses and analyses. The new edition contains two new chapters: one on fractional replication of factorial experiments and another on the new method of study of response surfaces, using factorial experiments, that has been developed in the chemical engineering industry but which is likely to be of value to any research workers seeking optimum conditions for the value of a quantity controlled by several factors. References to some new incomplete block designs have been added, and other minor alterations have been made.

The usefulness of this excellent book has been increased by these changes. It is not a book which is meant to be read in page order, though the first five chapters could, with advantage, be approached that way. It is rather a book, the relevant parts of which can usefully be studied when a design problem of a particular type arises. The writing is clear and the indexing adequate. It can be warmly recommended.

D. V. L.

1068 DE HEVESY, G. C., FORSSBERG, A. G. & ABBATT, J. D. (Editors)
**Advances in radiobiology. Proceedings of the Fifth International Conference on Radiobiology held in Stockholm on 15th-19th, August, 1956.** Oliver & Boyd, Edinburgh 1957 : 77s. 6d. : Pp. xvi + 503 : figs. : tables : plates.

Recent developments in atomic weapons have rendered a number of topics, formerly of restricted medical interest, matters of general concern. Many of these topics were the subject of papers at the above congress and will interest plant breeders *qua* human beings. Confining this notice however to matters of interest to plant breeders *qua* breeders, there is also much of special relevance.

The proceedings of the conference are divided into nine sections, the last of which is devoted to radiation genetics. In the first paper of this section, Principles of back mutation as observed in *Drosophila* and other organisms, H. J. Muller and I. I. Oster defend the view that back mutations can be induced in *Drosophila* by X irradiation. The next paper, by T. C. Carter, on Genetic implications of irradiation in man, advocates the use of the relative system for measuring induced mutation, in which the spontaneous mutation rate is the frame of reference. Two papers were read on detrimental mutations, The induction of detrimental mutations in *Drosophila* by X-rays, by K. G. Lüning and S. Jonsson, and Rate of development of X-ray-induced detrimentals and the influence of selection pressure, by G. Bonnier; the opinion is expressed that detrimental mutations are of great importance in population genetics.

In a stimulating paper on Comparison of chemically- and X-ray-induced mutations in *Drosophila melanogaster*, O. G. Fahmy and M. J. Fahmy claim that the types of mutations induced by alkylating compounds differ markedly from those induced by X rays. The mechanism of induced mutation was probed by F. H. Sobels in his paper on The possible role of peroxides in radiation and chemical mutagensis in *Drosophila*, in which evidence was cited to support the view that the peroxide level of the cell is an important determinant of the frequency of chromosome breaks and mutations. The relation between $P^{32}$ intake and mutagenesis was discussed by P. Oftdal and J. C. Mossige in their paper Incorporation and mutagenicity of $^{32}P$ in *Drosophila* sperm.

New light has recently been thrown on the nature of induced chromosome breakage by the application of chelating compounds. These developments are the subject matter of S. Wolff's contribution, Recent studies on chromosome breakage and rejoining.

I. I. Oster's paper on Modification of X-ray mutagenesis in *Drosophila* demonstrated that the spermatid was far more sensitive to X irradiation than other stages in spermatogenesis. In the last paper in the section, Recovery of chromosomes from X-ray damage, K. Nordback and C. Auerbach discuss environmental factors which cause a reduction in the frequency of induced mutations and chromosome breaks.

Among the papers presented in the other sections, the following are most relevant to plant genetics: the three papers in Section I on Initial or primary effects of irradiation by F. Hutchinson, P. Alexander, and G. Stein and A. J. Swallow; the three papers in Section IV on the technique of Alpha particle irradiation of single cells by R. J. Munson, R. Munro, and M. I. Davis, I. Simon-Reuss and C. L. Smith; The effects of pre- and post-treatment on the radiation sensitivity of micro-organisms, by A. Hollaender; Studies on the mechanism of protection against ionising radiation by compounds of the cysteamine-cysteine group, by A. Pihl and L. Eldjarn; Recent research on the chemical protectors and particularly on cysteamine-cystamine, by Z. M. Bacq; The problem and constitution of radiation-sensitising agents, by R. Koch; and 'Induction' by long-term irradiation in lysogenic bacteria, by H. Marcovich and R. Latarjet.

1069 DICK, W. E.
**Atomic energy in agriculture.**
Butterworths Scientific Publications, London 1957 : 15s. : Pp. x + 150 : 15 figs. : 8 tables : 16 plates.

This volume forms one of a series, entitled Atoms for Peace, which is based on papers read at the International Conference on the Peaceful Uses of Atomic Energy held by the United Nations at Geneva in 1955 [cf. XXVII, 3751–9]. The first chapter, of greatest interest to readers of *Plant Breeding Abstracts*, gives the background to the specialist reports of work in the field of radiation genetics and some details of recent progress, especially in the USA. The next four chapters discuss the use of radioactive tracers in studies of photosynthesis (chap. 3), mineral nutrition of plants (chap. 4), life histories of insect pests (chap. 5) and forestry (chap. 6) while the final chapter deals with the use of atomic radiation in food preservation. The author's style is very readable and seems especially suited to the "general" scientific reader for whom the book is primarily intended. A considerable quantity of information is packed into its 146 pages and suggestions for further reading are included in the text but a more detailed index would increase the book's usefulness.

1070 COMAR, C. L. (Editor)
**Atomic energy and agriculture.**
Publ. Amer. Assoc. Advanc. Sci. 1957 : No. 49 : $9.50 : Pp. x + 450 : figs. : tables : plates.

On 27–29 December, 1955, a symposium on Atomic energy and agriculture was held at the Atlanta meeting of the American Association for the Advancement of Science and the present volume is made up of the contributions to that symposium. Most plant breeders will turn first of all to the contribution on the use of radiation in plant breeding by W. R. Singleton, who traces the development of radiation breeding from its initiation thirty years ago, by Muller and Stadler, working with X rays not atomic rays it is true, applied to *Drosophila* and barley respectively. The development of the barley work by Gustafsson and his colleagues in Sweden is described briefly and the results are compared with those of later work with maize, the opinion being expressed that ultraviolet radiation compares favourably with either X rays or thermal neutrons in the production of mutations in economic plants. The relative neglect of mutation breeding in the USA in the interwar years is contrasted with the active programmes now sponsored by the Atomic Energy Commission; the results of the first seven years of operation of the gamma field at the Brookhaven National Laboratory, using $\mathrm{Co}^{60}$, are commented upon; the experiments have shown for instance that mutations can be induced by irradiation for quite short periods during the sensitive period, which for maize occurs "about one week prior to pollen shedding but definitely after meiosis". Thus for maximum efficiency in inducing mutations plants should not be grown in the radiation field but moved in for a short time only. New varieties of carnations and peanuts [cf. XXVI, 1756] and disease-resistant oats [XXV, 975] are mentioned among the practical results of mutation breeding. This leads the author to a sanguine and somewhat uncritical statement of the future possibilities, based on the assumption that if one resistance can be produced by mutation all others will ultimately follow and the American chestnut, *Castanea dentata*, for instance, will be saved from extinction by *Endothia parasitica*. We hope his optimism is justified.

Other contributions of possible interest to our readers deal with the role of tracers in root development investigations, photosynthesis, $\mathrm{N}^{15}$ as a tracer of nitrogen metabolism of plants, the translocation of organic nutrients in plants, and absorption and translocation of plant regulating compounds.

1071 Henderson, I. F., Henderson, W. D. & Kenneth, J. H.
**A dictionary of scientific terms.**
Oliver & Boyd, Edinburgh 1957 : 6th Ed. : 32s. : Pp. xvi + 532.

The present edition [cf. XXIV, p. 139] of this well-known standard biological dictionary appears only four years after its predecessor, which supplanted the fourth edition after a similar period. Since each of these editions included many fresh entries, they indicate both the rapid development of biological language and the necessity for dependable guides to it.

The layout of the present edition is the same as in the earlier editions and the number of terms explained is now around fourteen thousand. No dictionary, however, can keep pace with genetics and such frequently occurring genetical terms as transduction and parasexual have not yet been entered. It is possible to criticize some of the explanations, neo-Darwinism and neo-Lamarckism for instance are not happily described, but in general the standard of definition is consistently lucid, and this edition promises to maintain the position of "Henderson" as the foremost biological dictionary in the English language.

1072 Goldstein, P.
**Genetics made easy.**
Rider & Company, London 1957 : 15s. : Pp. 244 : 64 figs.

Queen Scheherezade won immortality by recounting a different tale on 1001 successive nights; Mendel is coming close to the same achievement, the only difference being that it is the same tale that is recounted in successive textbooks. A volume reviewed earlier [XXVI, p. 122] now appears in an English edition, though there is nothing to indicate that on either the dust cover or in the volume itself. The introduction by Professor Emeritus P. W. Whiting has been replaced by one by Professor C. H. Waddington but text, apart from an occasional hyphen and certain orthographical changes such as analyse for analyze, and illustrations remain the same.

1073 Altenburg, E.
**Genetics.**
Henry Holt & Co., New York 1957 : $6.50 : Pp. xv + 496 : figs. : tables.

In the twelve years that have passed since the appearance of the first edition of this book [cf. XVI, p. 247], many advances in genetics have been made, including new developments in the study of cytoplasmic inheritance, artificially induced mutation, pseudoallelism and the genetics of microorganisms. Material on all of these subjects, which were treated cursorily or not at all in the first edition, has been added to the present volume and most chapters on other topics have received changes or additions. The result is a considerably expanded text, useful and reasonably up to date. As was noted in our previous review, however, examples of genetical principles seem to be taken from the animal rather than the plant kingdom whenever possible, so that the book is of general rather than special interest to the student of plant genetics.

Other changes from the earlier volume are the omission of the summaries and the addition of reference lists at the chapter ends.

1074 McElroy, W. D. & Glass, B. (Editors)
**A symposium on the chemical basis of heredity.**
Johns Hopkins Press, Baltimore; Oxford University Press, London 1957 : £5 : Pp. xi + 848 : figs. : tables.

Previous symposia of the McCollum-Pratt Institute of the Johns Hopkins University have been biochemical in scope. The present symposium deals with the biochemical substructure of genetics and affords as good an insight into contemporary research on the fundamentals of genetics as any other existing survey. This is partly because the organizers of the symposium managed to assemble together a very high proportion of research workers active on the most rapidly advancing lines of genetic investigation. Secondly, the discussions following the papers are given in considerable detail and assist the reader to arrive for himself at a critical assessment of the many new developments discussed.

The symposium is divided into eight parts, the first of which is entitled Cellular units of heredity. The first paper, The role of the nucleus in heredity, by G. W. Beadle, is a general introductory survey, stressing however the importance of gene conversion for which the term transmutation is preferred. H. Ris, in Chromosome structure, is mainly concerned with the information provided by electron microscopy; he subscribes to the views that the basic unit of chromosome anatomy is the fibril, reckoned to be ca. 200 Å. thick, and that this is the unit both of structure and reproduction.

S. Benzer, in his paper on The elementary units of heredity, earned the approval of the other participants in his fragmentation of the gene into three more fundamental entities, the recon, the unit of recombination, the muton, the unit of mutation, and the cistron, the unit of function as manifested in the cis-trans test of Lewis. While the recon and muton are estimated to be limited to not more than two and five nucleotide pairs, respectively, the cistron may include over a hundred mutable sites.

Gene conversion is discussed in two papers: Crossing over and gene conversion in Neurospora, by H. K. Mitchell, and Gene conversion and problems of allelism, by P. St. Lawrence and D. M. Bonner.

The last two papers in this section are a paper on the *td* loci in *Neurospora* entitled Gene function and enzyme formation by S. R. Suskind and a review of cytoplasmic inheritance mechanisms, principally in *Paramecium* and *Tetrahymena*, by D. L. Nanney, the title of his paper being The role of the cytoplasm in heredity. The latter paper and the ensuing discussion include some interesting remarks on the present status of the master-molecule and steady-state hypotheses of hereditary determination.

Part II, the Role of the nucleus, nucleic acids and associated structures in cell division and protein synthesis, comprises six papers. In the first, Some problems in the chemistry of mitosis, D. Mazia describes the biochemistry of the mitotic apparatus. M. Alfert's paper, Some cytochemical contributions to genetic chemistry, deals, in particular, with the constancy of nuclear DNA within tissues and within species. The recent work on the relationships between protein, RNA and DNA syntheses is summed up by V. Allfrey, A. E. Mirsky and S. Osawa in their paper, The nucleus and protein synthesis. A somewhat different treatment of the same theme by S. Spiegelman, Nucleic acids and the synthesis of proteins, includes a useful review of the present state of the template hypothesis of protein synthesis. Some dissent was expressed however at the use of the term shockate for protoplasts subjected to osmotic shock.

G. C. Webster's paper, Effects of nucleotides on the incorporation of amino acids into protein, is particularly concerned with biosynthesis in pea microsomes. The final paper of this section is by H. J. Vogel on Repression and induction as control mechanisms of enzyme biogenesis: the "adaptive" formation of acetylornithinase; in this paper the author exemplifies how enzyme induction may come about through removal of a repressor.

The title of Part III is Nucleic acids as transforming agents. The first four papers in this part are specialist studies on transforming agents affecting *Pneumococcus* and *Haemophilus*, namely, X-ray inactivation studies on solutions of transforming DNA of Pneumococcus, by H. Ephrussi-Taylor, Criteria for quantitative genetic transformation of bacteria, by R. D. Hotchkiss, Studies on transformation of *Hemophilus influenzae*, by S. H. Goodgal and R. M. Herriott, and Photoreactivation of *Hemophilus influenzae* transforming factor for streptomycin resistance by an extract of *Escherichia coli* B, by S. H. Goodgal, C. S. Rupert and R. M. Herriott. The last paper in this section is on Chromatographic fractionation of *E. coli* DNA containing 5-bromouracil-2-$C^{14}$, by A. Bendich, H. B. Pahl and G. B. Brown.

Part IV includes some papers of wide genetic interest and is entitled Viruses as bearers of heritable characteristics. The first two papers, The virulent $T_{even}$ phages of *Escherichia coli* B, by R. M. Herriott, and Transduction: a comparative review, by P. E. Hartman, afford a comprehensive survey of transduction studies. An informative review of lysogeny and the nature of prophages is found in the article on Genetic aspects of lysogeny, by F. Jacob and E. L. Wollman.

In the last paper of this section, The nature of the progeny of virus reconstituted from protein and nucleic acid of different strains of tobacco mosaic virus, H. Fraenkel-Conrat, B. A. Singer and R. C. Williams describe an important series of experiments on synthesizing tobacco-mosaic virus strains from the RNA and protein components of two different initial strains. Specific infectivity of virus strains synthesized from RNA from a strain A and protein from a strain B is of the type characteristic of strain A. Therefore the RNA appears to be the primary genetic determinant in tobacco mosaic virus. However, the protein component does also appear to have a minor effect in virus replication.

Purely chemical considerations preponderate in Part V, Nucleic acids—chemical composition and structure. E. Chargaff opens with some healthy criticisms of current anticipations that a little further study of the nucleic acids will solve all biological problems. His paper is entitled Base composition of deoxypentose and pentose nucleic acids in various species. F. H. C. Crick, on The structure of DNA, deals principally with physical chemical evidence on the twin-helical structure of DNA, and is followed by J. A. V. Butler and K. V. Shooter on The physical heterogeneity of DNA, in which they show that single DNA samples may show a very wide range in sedimentation constant.

RNA has proved far less tractable to the physical chemist than DNA. What is known about its structure and that of its artificial analogues is summarized in two papers, X-ray studies on RNA and the synthetic polyribonucleotides, by J. D. Watson, and The structure of synthetic polyribonucleotides and the spontaneous formation of a new two-stranded helical molecule, by A. Rich. A rather fruitless examination of the Importance of helices in molecules of biological origin, by B. W. Low, concludes this section.

Most of the papers in the next part, Synthesis of nucleotides and nucleic acids, are likely to interest biochemists more than geneticists, but the account by S. Ochoa and L. A. Heppel on Polynucleotide synthesis, one of the outstanding biochemical achievements of the last few years, and the discussion on the problem as to how RNA acquires biological specificity, is of very general interest. The other papers in this section are: Pathways of enzymatic synthesis of nucleotides and polynucleotides, by A. Kornberg; The enzymatic conversion of deoxyuridylic acid to thymidylic acid and the participation of tetrahydrofolic acid, by M. Friedkin and A. Kornberg; The nature of RNA labeling in homogenates, by V. R. Potter, J. H. Schneider and L. I. Hecht; The biosynthesis of nucleic acids in some microbial systems, by S. S. Cohen; and RNA metabolism in T2-infected *Escherichia coli*, by E. Volkin and L. Astrachan.

Part VII, Mechanism of duplication, contains two contributions only. In a paper by M. Delbruck and G. S. Stent On the mechanism of DNA replication, the bizarre literature that has grown up around attempts to untie the knots into which Watson and Crick have tied deoxyribonucleic acid, in order to allow it to reproduce, is reviewed. In addition, isotopic tracer experiments are described which have been devised to throw light on the DNA replication mechanism and on the apparently bipartite structure of phage DNA. The authors make a useful distinction between proposed DNA replication mechanisms in respect of the distribution of the atoms of the parent molecule over the replica duplexes. In conservative mechanisms, the integrity of the entire parental duplex is maintained, in semiconservative mechanisms, the atomic identity of single chains of the parental duplex is preserved, while in dispersive mechanisms, the chains of the parental duplex are ruptured and the atoms distributed among the replica duplexes. This distinction results in considerable theoretical clarification; unfortunately this serves to emphasize the difficulties of unambiguous interpretation of any of the experiments so far performed. The other paper; The molecular basis of genetic recombination in phage, by C. Levinthal and C. A. Thomas, Jr. explores the role of hydrogen bonds in mating between DNA molecules.

The symposium closes with an extensive summary by B. Glass.

1075 Williams, R. J.

**Biochemical individuality.**

Chapman & Hall, Ltd., London & John Wiley & Sons, Inc., New York 1956 : 46s. : Pp. xiii + 214 : 17 figs. : 17 tables.

"What is a normal individual?" asks the author. That would seem to be a simple enough question on the face of it, though we all know the difficulty of defining the "average" Englishman, or the average American, Russian or Chinese. A glimpse at the principles of biochemical genetics however, as given in chapter 2, quickly shows the almost unlimited possibilities that exist for variation in respect of practically any feature of an organism we may choose to study. Variations in size and weight of various organs in animals, including man, are analysed in chapter 3, and succeeding chapters are devoted to variations in composition, enzymes, endocrine activities, excretion patterns, pharmacological manifestations and nutritional requirements. It is convincingly demonstrated that in respect of all these, and many other features, individuals vary very materially. "Normal individuals are always abnormal with respect to some of their numerous attributes and to be 'normal' in every respect would be most unusual".

A preoccupation with the supposedly normal or standard, it is submitted, has led a great number of workers to ignore or overlook this individual variation and has greatly retarded the development of medical practice as well as a true appreciation of the constitution of the average population. The author's basic thesis can be summed up in his statement that "alcohol does things to some individuals which it does not do to others". To one versed in the almost endless variation of individuals in the plant world or in microorganisms the presentation of the thesis may seem rather laboured, though a visit from the family doctor may correct this impression. Each chapter is filled with a mass of convincing data carefully presented and the book could be read with profit by any reader interested in general biology, as well as by students of genetic variation and its repercussions on a wide range of biological processes; it can be recommended for the most careful perusal by all members of the medical profession.

It would have benefited from a little more care in proof correction, particularly in the paragraph beginning with line 28 of page 144.

1076 Bourne, G. H. & Danielli, J. F. (Editors)
**International review of cytology, Volume 6.**
Academic Press Inc., New York & London 1957 : $12.00 : Pp. 566 : figs. : tables.

This year's volume [cf. XXVII, p. 153] is devoted almost exclusively to topics concerning the animal kingdom. The first review is on the antigen system of *Paramecium aurelia*, by G. H. Beale, who recapitulates the main features of the reproductive biology of this organism before passing on to a review of the results of experimental work published since 1954, together with a certain amount of unpublished material. It is shown that, in this organism at least, cells containing a fixed set of genes can exist in different cytoplasmic states, as a result of which diverse products may be formed, without any change in genic constitution. A given cytoplasmic state usually favours the expression of genes at one particular locus, which in turn however control the cytoplasmic state. Two alternative hypotheses to explain the phenomena are presented, though neither is satisfactory in explaining all the facts.

R. C. Williams writes on the role of the electron microscope in virus research; by modern techniques it is now possible, it seems, to obtain electron micrographs of virus-containing preparations that are quantitatively representative samples of the original suspension, and at the same time to preserve the structure with a high degree of faithfulness. One welcomes the numerous words of caution in respect of interpretation of what is seen. Nevertheless, it now seems clear that tobacco-mosaic virus is a gigantic helix composed of protein subunits wrapped helically around an RNA core-like structure; when the molecule is broken down the protein fraction is inactive but the RNA portion has one tenth the normal lesion-producing ability. In the section devoted to bacterial viruses, the suggestion is made that fibres of the phage tail are wrapped helically to form the outer tail structure, and make the initial contact with the bacterial surface; after that it may be that the core is forced into the bacterium by an unwinding action of the tail fibres and that the proximal end of the core is attached to one or more strands of DNA within the head, which serve to pull the genetic material into the bacterium. Conversely, in the formation of new virus particles, the last operation in the phage assembly line is said to be the attachment of the tail to the head structure. In the review on Enzymatic and metabolic studies on isolated nuclei, by G. Siebert and R. M. S. Smellie, which is also restricted mainly to studies on animal tissues, we read that the mechanism by which DNA can exert an influence on the genetic make-up of the cell remains unknown, there being little evidence to connect DNA directly with synthetic processes. Both cytoplasm and nucleus are capable of protein synthesis and there is some interdependence of the two in performing this function. For the present nothing more definite than this can apparently be said with certainty.

1077 Rabinowitch, E. I.
**Photosynthesis and related processes. Vol. II. Part 2.**
Interscience Publishers, Inc., New York & London 1956 : $18.50 : Pp. xvi. + 1211–2088 : figs. : tables.

In the summer of 1938 Professor Rabinowitch undertook to prepare a review of photosynthesis and related phenomena, thinking that two months' library work would see him through. By 1956, the review had reached 2000 printed pages and he felt that the time had come to stop, even though, as he says in his preface with a hint of regret, this meant stopping just at a time of rapid and promising developments in several fields.

The first part of the second volume of Professor Rabinowitch's massive work was published in 1951 [cf. XXII, p. 630]. In this final instalment the discussion of the kinetics of photosynthesis continues in the first third of the book; the remainder comprises various additions to volume I (published in 1945) and volume II, part 1. The section on kinetics is concerned with the temperature factor, the pigment factor, induction phenomena and photosynthesis in intermittent light. Among the developments discussed in the later chapters are: results of experiments using isotopic tracer carbon, indicating that a cyclic mechanism operates in synthesis as in the breaking down of carbohydrates; electron microscope studies of chloroplast structure; and further evidence in the quantum yield controversy, regarding which Professor Rabinowitch suggests that the most likely final outcome will be the experimental establishment of a minimum quantum requirement of between 6 and 8 quanta per oxygen molecule.

A treatise of this kind is bound soon to become out of date, but the author's method of presentation is such that, while describing experiments critically and discussing the validity of the theories propounded to explain them, he rarely commits himself definitely to a theory, so that his work, although necessarily becoming inincreasingly incomplete, will remain valid and form a valuable basis for further work for many years.

1078 Luck, J. M. (Editor)
**Annual review of biochemistry.**
Annual Reviews, Inc., Palo Alto, California 1957 : $7.00 : Pp. ix + 768 : figs. : tables.

Four articles in the current number of this well-known review series are of special interest to plant geneticists. In the first of these, X-ray studies of compounds of biological interest, by J. C. Kendrew and M. F. Perutz, a useful account is given of the light thrown by X-ray crystallographic techniques on the constitution of such genetically significant substances as the nucleic acids and virus particles. The Watson-Crick model for DNA is regarded as substantially correct. D. Steinberg and E. Mihalyi deal with The chemistry of proteins and refer to recently published cases of intraspecific variation in protein composition in mammals determined by quite simple genetic systems. An example is the normal-adult hemoglobin and sickle-cell hemoglobin distinction in man which appears to be controlled by a single locus. Amino acid and protein metabolism is treated by H. Kamin and P. Handler. This article includes a critical review of the template hypothesis of protein synthesis which, however attractive from the theoretical angle, presents a number of yet unsolved difficulties.

Perhaps the most useful article of all for the geneticist is the survey of The nucleic acids by W. E. Cohn and E. Volkin. Of particular interest is the discussion of variation in nucleic composition between and within species and of the validity of the base-ratio rule which is one of the principal evidences for the Watson-Crick model for DNA.

Among the other topics reviewed are biological oxidation, enzymes, lipide and carbohydrate metabolism, vitamins, steroids, porphyrins, biochemistry in the USSR and the biochemistry of muscle.

1079 Miller, E. V.
**Chemistry of plants.**
Reinhold Publishing Corporation, New York & Chapman & Hall, Ltd., London 1957 : 38s. : Pp. vii + 174 : figs. : 13 tables.

Many plant breeding programmes are principally concerned with improving quality and this, in many cases, implies selection for specific chemical substances. There is considerable scope for a concise, up-to-date manual of the main chemical constituents of plants but the claim of the blurb that we have such a book before us is an exaggeration. The main classes of plant chemicals are indeed treated; there are chapters devoted respectively to carbohydrates, proteins and other nitrogen compounds, lipides, plant pigments, enzymes, organic acids, plant hormones, glycosides, alkaloids, vitamins, elemental constituents, and other plant products. However, the various classes of substances described are not characterized in the detail necessary and an understanding of their nature is made difficult by the omission, in many cases, of structural formulae and, in some cases, by the provision of no more than empirical formulae. For anyone with little previous knowledge of organic chemistry, the text is likely to confuse. The enquirer into the nature of carbohydrates, for instance, will gather from the first paragraph of the book that $(CH_2O)_n$ is the type formula of the carbohydrates, excluding cane sugar to begin with, and will then puzzle over the absence of —CHO or =CO groups from the cyclic structural formulae provided for glucose, which p. 5 would lead him to expect, and will finally learn that, for simplicity, monosaccharide formulae are usually written as straight chains though in fact they have five or six-membered rings. The nature of stereoisomery is not explained.

1080 BUDD, A. C.
**Wild plants of the Canadian prairies.**
Canada Dep. Agric. 1957 : $1.50 : Pp. 348 : 50 plates.

This book is intended to serve as a simple guide to the native wild plants and more frequently occurring introduced weeds found in the area of Canada lying roughly between the great lakes and the foothills of the Rocky Mountains. Keys are provided to the families, genera and species described and a helpful guide to the use of these keys is included. A brief, clear description of each species is given together in some cases with interesting notes on their uses. These descriptions have been kept as simple as possible and in addition a glossary of technical terms is provided for those readers to whom they may not be familiar. Many of the terms in the glossary are illustrated in seven pages of small but generally clear diagrams but the usefulness of these illustrations is unfortunately much decreased by the fact that no reference is made to them in the text. Similarly no reference is made to the line drawings, numbering over 40, which occur in the main part of the text. Some taxonomists may object to the alphabetical arrangement of the genera and species within each family but such an arrangement is probably the most satisfactory for a handbook of this kind. Indices to the scientific names of families and genera and to the common names of the species described complete the book.

1081 ALLEN, P. H.
**The rain forests of Golfo Dulce.**
University of Florida Press, Gainesville 1956 : $8.50 : Pp. xi + 417 : 22 figs. : 34 plates.

The primary function of a flora to the field botanist is to supply a ready means to the identification of the plants he encounters. All too often the fulfilment of this function is impeded by the habit of giving a strictly systematic basis to the keys provided. The present work may send shivers down the spine of the rigid systematist, but will come as a welcome breath of fresh air to those who regard taxonomy and identification as distinct issues. In the words of the author the purpose of this book is "to attempt to reduce the use of field characters such as trunk, sap, leaf and bark differences to some sort of organized system." In some circumstances he admits, "initial identifications must usually rest on floral analysis, but once this has been accomplished there is no logical reason why the method must be continued indefinitely, since the more conspicuous characters can be made to serve the same end." And in the case of the particular ecological formation under consideration, the tropical rain forest, this procedure is more than ever desirable owing to the inaccessibility of the flowers and the erratic flowering habits of so many of the component species.

After some brief introductory chapters on the physiography and general ecology of the Golfo Dulce of Costa Rica, the author proceeds to general descriptions of the principal climatic, edaphic and transitional ecological formations, passing briefly over those which are not forested, but for the rest giving species lists, classified where necessary into layers, and keys for identification based on a wide variety of characters. The species lists do not claim to be comprehensive and the basis for their selection is admittedly subjective; somewhat less than a third of the total is included and each of these is described in an alphabetical index which occupies the bulk of the book, accompanied by some excellent line drawings.

A particularly valuable section on conspicuous and distinctive species gives keys to those species whose floral characters are easily recognized from the air or from a passing car, and others based on distinctive vegetative or other characters such as occurrence in concentrated stands, harbouring of ants or presence of coloured sap. The economic potentialities of the area are only in the early stages of investigation, but a contribution is made in the utilization lists which classify species according to their commercial, medicinal or poisonous properties. Some excellent photographs of the terrain and of individual species and parts of plants are provided and Latin diagnoses of some newly described species complete this valuable contribution to the study of the tropical rain forest. R. H. R.

1082 GLASS, B.
**Survey of biological progress. Vol. III.**
Academic Press Inc., New York & London 1957 : $.7.50 : Pp. 332 : 4 figs. : 3 tables.

The third volume of this series maintains the high standard of the earlier issues [cf. XXIII, p. 347]. In a most useful review of Trends in systematic botany, D. D. Keck points out how versatile taxonomists have become, having been taught to realize that contributions to systematics may come from almost any of the biological fields. After a brief historical introduction he outlines the contributions that may be made by anatomy, pollen morphology, seed characters, embryology, fossil evidence, parasitism, chemistry, cytogenetics and apomixis, due mention being also made of the limitations of each of these lines of approach. The sections on cytology and genetics are the most extensive and a special section is devoted to results of a team of experimental taxonomists at the Division of Plant Biology of the Carnegie Institution of Washington, on the Standford University campus, in which hundreds of thousands of plants were grown for a study of the interrelationships of members of the Composite subtribe Madiinae (Heliantheae), in particular that part of the experiment which concerns the genus *Layia*. Fifteen species are now established; of the 14 species previously described only 10 are now recognized as bona fide species of *Layia*, 3 having been reduced to synonymy and 1 transferred to another genus. But the 5 new ones include 3 previously undiscovered in nature, and 2 that cytological and genetical data indicated must be recognized as equally distinct as any other. *L. paniculata* for instance despite its morphological similarity to *L. hieracioides*, which caused it to be overlooked previously as a taxon, is shown by the experimental evidence to have been amply distinct both cytologically and genetically probably for a long time. These studies emphasize the need to search for relationships rather than morphological differences in arriving at a correct systematic arrangement, and classification, it is suggested, should be "based on a consideration of all the evidence—morphological, ecological, cytological, and genetical—because each line contributes to a better understanding of the biological picture." Hybrid complexes are also accorded special consideration in a separate section, in which outlines are given of the story of *Crepis* [cf. XVIII, p. 178], the pteridophytes [cf. XXI, p. 223] and some other interesting groups.

R. Levine writes On the mechanism of action of hormones on cells, considering insulin, adrenalin, the thyroxine group, the steroids and the estrogens and progesterone in turn, and arriving at the conclusion that "cytoarchitectural considerations are leading to the creation of a geometrical outlook in cell chemistry, in addition to the purely arithmetical concepts of concentration, rate, equilibrium, etc."; special importance is ascribed to the surfaces, not only of the cell itself but of organelles such as nuclear or mitochondrial membrances, for their selective function in the process of absorption and excretion.

In Respiration and cellular work and the regulation of the respiration rate in plants, G. G. Laties presents a current concept of the regulation of the rate of respiration and of energy coupling in metabolism, in which it is assumed that useful cellular energy is derived from the operation of the tricarboxylic acid cycle in conjunction with the cytochrome oxidase system.

Other reviews in the volume deal with embryology, with chromosome evolution and speciation in animals and with chemoreception and the behaviour of insects.

1083 **The world of learning.**
Europa Publications Ltd., London 1957 : 8th Ed. : £6 : Pp. xxxii + 1038.

Readers of *Plant Breeding Abstracts* will need no introduction to this work of reference which, since it first appeared in 1947, has become deservedly well known as a very useful guide to scientific, educational and cultural organizations throughout the world and their principal personnel. The eighth edition which, like its immediate predecessor [cf. XXV, p. 629], is twice as long as the original volume, keeps the information reliably up to date and, in the case of some countries, notably China, expands it. The cumbersome index of institutions has now been jettisoned in favour of a combined and detailed table of contents and subject index placed at the beginning: with this change the work yields its information more readily.

1084 SUBBIAH MUDALIAR, V. T.
**Principles of agronomy.**
Bangalore Printing & Publishing Co., Ltd., Bangalore 1956 : Rs. 17–8–0 : Pp. xviii + 440 : 52 figs. : tables.

This new addition to the slowly growing number of text books on agriculture in India is intended mainly for students of agriculture and covers the syllabus prescribed by the universities in South India; but since it assumes little basic scientific knowledge other than elementary chemistry it may also be of use to the general reader with an interest in Indian agriculture. The work falls into four sections. The first, on soils, discusses soil formation, structure, composition and erosion. The second, concerned with tillage, describes a wide range of both primitive and modern farming implements and considers the problems of mechanization in India. The third deals with methods of irrigation and the fourth with manuring and soil fertility. Despite occasional oddities of wording and punctuation, the author's style is readable and clear and gives incidentally some vivid impressions of Indian farming practice.

Two appendices, one on climate in India and the other on field experiments and the analysis of their results, complete the text. A short bibliography and index are also provided.

1085 Clifton, C. E. (Editor)
**Annual review of microbiology. Vol. 11.**
Annual Reviews, Inc., Palo Alto, California 1957 : $7.50 : Pp. vii + 536 : figs. : tables.

This year's volume [cf. XXVII, p. 158] contains a review of Bacterial genetics, by L. L. Cavalli-Sforza, in which the subject is treated under the heads mechanisms of genetic transfer; genetic changes in individuals and populations; phenogenetics; some cytological contributions; taxonomy and the species problem. While mainly serving to emphasise the extent of our present ignorance, it does report, among other things, further evidence confirming that transforming principles consist of deoxyribonucleic acid; particles of two sizes apparently exist and one molecule is sufficient to effect transformation of one cell. Transfer of genetic material by conjugation is described as taking place by a process which is likened to a recording wire carrying the genetic information being unwound from a reel in the male and wound up again on a reel in the female. In connexion with lysogenic conversion we read that "the boundary between phage and bacterial genes is becoming thinner and thinner". More data have been assembled supporting the analogy of a chromosome region affecting a particular biochemical process with an assembly line. Attention is given to the relationship between DNA synthesis at different temperatures and duplication of nuclei and cells and finally, to the impact of genetic and transduction studies upon bacterial taxonomy.

The transduction of colicinogenic properties from colicinogenic to noncolicinogenic strains of *Escherichia coli* by mixed culture is dealt with by P. Fredericq in an essay on Colicins; the transduction can be effected not only from strains of *E. coli* but from members of other genera, including various species of *Shigella, Klebsiella* and *Salmonella.* The proportion of cells transduced varies with the sensitivity of the strain and may in certain cases reach 100%. The colicinogenic properties have, however, been shown to be independent of the normal genetic structure of the bacteria, and the suggestion is put forward that they are the result of some pathogenic agent which might be considered as a bacterial virus, distinct from but closely related to a bacteriophage.

There is another Review of the microbiological and immunological literature published in 1956 in the USSR by P. Grabar and the volume also contains reviews on Variation in animal viruses, by M. Edney, Nongenetic effects of radiation on microorganisms, by R. F. Kimball and Genetics of the Protozoa, by J. R. Preer, Jr.

1086 Fischer, G. W. & Holton, C. S.
**Biology and control of the smut fungi.**
The Ronald Press Company, New York 1957 : $10.00 : Pp. x + 622 : 107 figs.

The authors, who are respectively Professor of Plant Pathology at the State College of Washington and Pathologist in Charge at the Regional Smut Research Laboratory, Pullman, Wash., have succeeded in compiling a very comprehensive survey of information on the Ustilaginales, which also includes some hitherto unpublished data. The opening chapter on morphology, taxonomy and symptomatology is followed by chapters on history and economic importance, nomenclature and phylogeny, secondary effects on the host, and life history and parasitism. The sixth chapter is concerned with growth on artificial media and includes an account of haplo-lethal deficiencies and sex-linked cultural characters. The next three chapters deal respectively with (1) cytology, (2) hybridization, mutation and genetics and (3) physiological specialization. Chapter 10 provides a useful summary of knowledge on host-variety reactions and the genetics of resistance to wheat bunt and the various smuts attacking cereals and other economic plants. Chapter 11 discusses the effects of smuts on man and animals. Chapter 12 describes methods suitable for spore germination, production of pure cultures, inoculation of the host, identification and classification of physiological races, cytological and histological investigations, and testing fungicides for smut control, while the thirteenth and final chapter is concerned with control practices. An extensive bibliography of the world literature taking up about 150 pages and an index complete the work, which can be recommended without reservation.

1087 Hughes, H. D. & Henson, E. R.
**Crop production.**
New York and London : The Macmillan Company 1957 : Revised ed. : 48s. 6d. : Pp. xii + 620 : figs. : tables.

This text book, rewritten and rearranged by the senior author of the original work and two other agronomists of the Iowa State College, is intended for elementary college students in the USA. It contains 54 chapters, designed to provide an introduction to the subject on a world basis and detailed instruction on the botany, economics of production, cultural methods, utilization and processing of field crops in the USA. Unfortunately it cannot be recommended as a worthwhile book. Written in the style of a popular digest, often chatty to the point of inconsequence and tautology, it contains many interpretations, definitions and explanations which are highly unsatisfactory and in some cases even of dubious accuracy, chiefly as the result of inexcusable over-simplification. We read, for instance, that "Historians divide man's existence into three periods: 3,000,000 years of dead-level savagery, 10,000 years of hand-labour cultivation, with no significant change in the relation of man to his environment, 150 years of scientific progress." As a definition of hybrid vigour the reader is offered: "When two varieties or strains of corn are crossed by allowing the pollen of one strain to fall on the silks of the other, the progeny is likely to be more productive than the average of the parents. This is referred to as 'hybrid vigor'." To select two further samples from an embarassing abundance of choice: students writing such a definition of the Angiosperms and Gymnosperms as that on p. 49, or an account of flower structure and the essentials of fertilization such as may be found on p. 69, would hardly deserve to scrape through their examinations. A chapter on the general improvement of field crops by breeding and the application of genetics is included. Breeding also receives attention in some of the chapters on individual crops; the significance of the development of improved varieties of some important crops such as wheat and potato, particularly in respect of disease resistance, is, however, inadequately indicated. Another point: if hybrid sorghums are dealt with, why is a short account of hybrid sugar beets not also given? Such various faults seriously undermine the value of the reliable factual information the book does contain, at least on the production of individual crops. A glossary, an index and lists of questions at the ends of the chapters are provided, while the contemporary cult of personality is assuaged by a "Who's who of chapter-lead quotes". The maps included among the illustrations are in many cases on too small a scale to be of much help. Proof reading has not been rigorous in eliminating misspellings and inconsistencies in use of capitals and italics. A book dealing with ground already well-covered needs to be of a very much higher standard if its publication is to be justified.

1088 Spector, W. S.
**Handbook of biological data.**
W. B. Saunders Company, Philadelphia & London 1956 : 52s. 6d. : Pp. xxxvi + 584 : 445 tables.

The contributions in this handbook are divided under the following headings: (1) biochemical and biophysical characteristics; (2) genetics, cytogenetics and reproduction; (3) development and morphology; (4) nutrition, digestion and metabolism, (5) respiration and circulation; (6) other physiological activities and performances; (7) biologically active compounds; (8) environment and survival; (9) symbiosis and parasitism and (10) ecology and biogeography.

Section (2) contains some information of interest to plant breeders such as the chromosome numbers of many angiosperms, gymnosperms and fungi, data on the breeding systems of some common plants and data on hybrid vigour in maize. Section (9) contains lists of the Latin and common names of many plant pathogens. This book is primarily designed for students and experts who desire information outside their own field; for both it should prove useful. The small print may lessen the value of the book for some people.

1089 Roemer, T. & Rudorf, W. (Editors)
Handbuch der Pflanzenzüchtung.
**(Manual of plant breeding).**
Paul Parey, Berlin & Hamburg 1956 : 2nd Ed. : Lief. 14 : Vol. 1 : Bogen 46–50 : 721–800; Lief. 15 : Vol. 2 : Bogen 21–25 : 321–400; Lief. 16 : Vol. 4 : Bogen 1–5 : 1–80; Lief. 17 : Vol. 1 : Bogen 51–53 : 801–48 + XXIII : figs. : tables : DM 13.50.

Instalment 14 [cf. XXVII, p. 597] completes the section on polyploidy in volume I, continues with a section on Biometrie der Pflanzenzüchtung [Biometry of plant breeding] by F. W. Schnell, and continues with the beginning of a section on Planung und Auswertung von Versuchen [Planning and interpretation of experiments] by I. Bachér. Instalment 15 continues the section on barley in volume II. Instalment 16 comprises a section on Lupinen als Körnerleguminosen und Futterpflanzen [Lupins as grain legumes and forage plants], by J. Hackbarth and H.-J. Troll, and continues with part of a section on Wicken-(*Vicia*)-Arten [Species of vetch (*Vicia*)], by L. Lechner. Instalment 17 comprises the remainder of the section on planning and interpretation of experiments in volume I, a section on Vererbungsanalysen bei quantitativer Merkmalsvariation [Genetic analysis in quantitative variation of characters], by F. W. Schnell, and the subject index, prefaces and table of contents for volume I, thus completing the volume.

1090 Sizov, I. A. & Ivanov, A. P.
**(Breeding and seed production of field crops).**
Sel'hozgiz, Moskva-Leningrad 1955 : 9 r. 65 k. : Pp. 487 : 101 figs. : 57 tables. [Russian].

This volume is one of a series of teaching manuals for agricultural technical schools. In the introductory chapter some of the achievements of plant breeding in the Soviet Union are enumerated, including the production of cotton varieties capable of growing in more northerly regions, varieties of jute that can be cultivated in Soviet territories and fruits that ripen in Siberia. The failure of most crop varieties introduced from abroad is contrasted with the success of Russian wheats in North America and Russian clover and flax varieties in many parts of Europe. In an historical review of plant breeding in Russia special mention is made of the achievements in the Czarist period, particularly those of Koelreuter. The appreciation of Darwinism and its significance are mentioned; some errors in his theory are suggested, the chief of these being the Malthusian element involved in the principle of the struggle for existence and the passive conception of the role of natural selection.

An outline is given of the foundation and development of the main research stations concerned with plant breeding and seed production in Russia, before and after the revolution, and of the development of the Mičurin-Lysenko principles, a full explanation of which is given in chapter 2. The elements of botanical taxonomy are elucidated in chapter 3, species being defined according to Lysenko's concept that individuals of the same species do not compete. This is supported by figures showing that ancient land races in many parts of the Soviet Union are complex populations comprising several botanical varieties but never more than one species. Information is given on the range of variation found in a number of different characters in species of wheat, barley, flax and a number of other crop plants and the concept of agricultural variety is defined; the value of land races is explained and some figures are given showing the extent to which they, or selections and hybrids from them, are still grown in the USSR; cases are cited of varieties selected in one area that have proved successful in many others; most varieties are, however, confined to areas with a particular range of ecological conditions and an established variety should not, it is stated, be replaced by a new one unless this is 10–15% better in yield and not inferior in other properties. Examples of varieties that have done this are Novoukrainka 83 wheat, with an average yield of 30·4 c. per ha. in 1936–45 as compared with 23·2 c. from Ukrainka, which was also not so good in baking quality; the maize hybrid VIR 42 [Institute of Plant Industry 42], which exceeds the open-pollinated varieties by 6–7 c. per ha. in grain yield; the sunflowers Ždanov 8281 and Fuksinka 3, 16–33% better than older varieties in yield; and the sugar beet Verhnjačka 38–73, giving 9 c. of sugar per ha. more than previous varieties.

The methods of breeding described include selection, crossing, vegetative hybridization and testing under various conditions artificially produced, as well as under the natural environment of the area for which the crop is designed. The methods employed in carrying out these various operations in the Soviet Union are described and illustrated; much importance is attached to the conditions under which hybrids are raised and data are reported to show that $F_2$ generations of a number of crosses between resistant and susceptible oat parents varied in their resistance to smut according to the conditions under which the $F_1$ had been grown; flax crosses produced taller hybrids when grown in places with long days, temperate climate and moist soil; it is stated that hybrids maturing earlier than the $F_1$ cannot appear in the succeeding generations; pollination with limited amounts of pollen and any other measures which reduce the extent of selective fertilization are said to cause segregation in the hybrids, whereas free open pollination of emasculated plants leads to uniform progeny, usually resembling the maternal parent. A number of varieties produced by hybridization are enumerated, including some winter wheats raised from crosses of wheat with *Agropyron*.

By making use of differences in the tissue in different parts of an organism improvements have been effected in starch content and blight resistance in potatoes and sugar content in sugar beets. The loss of vigour resulting from inbreeding can, it is claimed, be avoided by dividing a plant into parts and growing them separately.

An account is given of the methods used in testing resistance to cold, drought, diseases and pests and various qualitative properties such as baking quality and fibre quality. The systems of multiplication and testing of new varieties are described and details are given of the methods of seed production; this includes reproduction of seed under suitable climatic and agricultural conditions, special measures such as summer planting of potatoes and winter cereals and winter sowing of spring cereals, intravarietal hybridization, free open pollination, supplementary pollination, selection for improved types and the production of hybrids in the case of maize. Methods of varietal approval and seed certification are described and information is given concerning the approved varieties of all the main agricultural crops, with descriptions of them.

1091 SCHWANITZ, F.
Die Entstehung der Kulturpflanzen.
**(The origin of cultivated plants).**
Springer-Verlag, Berlin 1957 : DM 7.80 :
Pp. 151 : 59 figs.

Starting with an enumeration of a surprising number of plants that are utilized, for the most varied purposes, without being cultivated, this readable booklet passes on to show the gradual stages whereby such plants may be turned into objects of deliberate cultivation, as in the examples of *Hippophae rhamnoides*, *Valerianella olitoria*, *Ilex paraguayensis* and many others. The features that distinguish true cultivated plants from their wild relatives are examined; one of these is the greater range of variation in most cultivated plants, which is illustrated by the many forms of cultivated *Brassica*, thought to have had their origin in mutation. How such a process can be accomplished artificially, with the production of an entirely new crop plant, is exemplified by the sweet lupins. The role of bud mutations in the origin of horticultural varieties, the production of useful induced mutations and the role of hybridization in giving rise to new combinations of characters and even new species all receive attention. Other factors considered are polyploidy and natural and artificial selection, or a combination of the two, as in the origin of rye and a number of other secondary cultivated plants as weeds in another crop. In outlining Vavilov's principle of gene centres a clear distinction is drawn between primary and secondary centres.

There follows a brief section giving outlines of the supposed origins of the main agricultural plants; for wheat, *Triticum dicoccoides* is regarded as the first species to be taken into cultivation but the account given of the origin of the other species takes little or no account of the more recent views of the Russian investigators [cf. XXVI, 1149 and XXVII, p. 158]. For maize, the place of origin is given as the Andes of Bolivia and Peru, with a secondary centre in Central America after hybridization with *Tripsacum*. The actual wild ancestor of the potato is left undetermined but *Solanum tuberosum* ssp. *tuberosum* is given as the form from which the European and North American potatoes arose.

The book is completed by a brief history of the development of plant breeding and the contributions it has made to the improvement of yield and quality not only in the common crop plants but in algae and a number of microorganisms.

The volume contains a number of illustrations, one of which, on p. 24, seems to have been reversed.

1092 KENT-JONES, D. W. & AMOS, A. J.
**Modern cereal chemistry.**
The Northern Publishing Co. Ltd., Liverpool, England 1957 : 5th Ed. : 105s. : Pp. ix + 817 : 125 figs. : 204 tables.

With the fifth edition, this well-known textbook has again been revised and expanded [cf. XVII, p. 495]. The latest edition is longer than the previous one by some 150 pages and its illustration has been considerably improved both numerically and qualitatively. With the following exceptions, the number and titles of the chapters remain unchanged: the chemical and physicochemical properties of flour are dealt with in a single chapter instead of two, a chapter on infestation by insects and mites has been incorporated and the final chapter has been enlarged in scope under the new title of Assay of vitamins, amino acids and bacteriological examination of flours.

1093 Dutt, N. L. & Thuljaram Rao, J.
**Coimbatore canes in cultivation.**
Indian Central Sugarcane Committee, New Delhi 1956 : 2nd Ed. : Rs. 25s. : Pp. 136 : figs. : tables : 40 plates.

The first edition of this excellent guide to the principal improved canes grown in India appeared in 1950 [cf. XXII, 2100]. The present edition has the same general layout as the first but includes descriptions and figures of six new Coimbatore canes, five Pusa clones and three from the Hebbal Research Station. Chromosome numbers have been added in the present edition and a new map showing the distribution of the improved canes in India prefaces the volume. This edition, like the first, can be recommended to all sugar-cane breeders.

1094 Wolf, F. A.
**Tobacco diseases and decays.**
Duke University Press, Durham, North Carolina 1957 : 2nd Ed. : $7.50 : Pp. xvi + 396 : 102 figs. : 5 tables.

This valuable work, first published in 1935 [cf. VI, p. 455] has now been largely revised by the author to bring the information up to date, as far as possible. The text has been rewritten and additional information is included on a number of topics which have recently become of importance, for example chemical injury caused by fungicides and varietal resistance to pests and diseases. A number of new illustrations have been included and the lists of references at the end of each section have been brought up to date although the bibliography at the end of the book has been omitted. An author index has been added, however, and the subject index has been considerably revised.

## NEW JOURNALS

### *Bjulleten' vsesojuznogo Instituta Rastenievodstva [Bulletin of the All-Union Institute of Plant Industry].*

The Bulletin will give readers a picture of the current activities of the institute and report from time to time on important developments in other countries in the subjects of plant industry and the biology and breeding of agricultural plants. The first number, abstracted in this issue of *Plant Breeding Abstracts*, included articles on double-cross maize hybrids, additions to the Leningrad plant collections, new varieties produced at the Institute and visitors received. The Bulletin is issued free of charge and is obtainable from the Institute of Plant Industry, Herzen St. 44, Leningrad, USSR.

### *Indian Agriculturist.*

The above journal is the publication of the Agricultural Society which was founded in India in September 1956, with the purpose of furthering both agricultural research and extension. The journal is to be issued twice a year. Further information may be obtained from the Secretary, The Agricultural Society, Department of Agriculture, University College of Science, 35, Ballygunge Circular Road, Calcutta 19.

### *Indian Oilseeds Journal.*

The Indian Central Oilseeds Committee commenced publication of this new quarterly journal in October 1956. Among the papers included in the first issue is one describing a new linseed strain and in the second a discussion of the breeding of *Brassica*, both of which will be of interest to plant breeders. Other aspects of the growing and processing of oilseeds are dealt with in the remaining contributions. The annual subscription is 12s. and further information may be obtained from the Editor, Indian Oilseeds Journal, Indian Central Oilseeds Committee, Gandhi Bavan, Hyderabad–1 (Deccan), India.

### *Stichting Nederlands Graan-Centrum.*

The first number of this new publication of the Netherlands Grain Centre, described as a news letter, appeared on 1 July 1957 and contained articles outlining work in progress at the centre and an article on yellow rust in Europe [cf. Abst. 326]. The news letter is to appear at irregular intervals. Further information may be obtained from the secretary, Dr. S. Broekhuizen, 31, Emmapark, Wageningen, Netherlands.

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